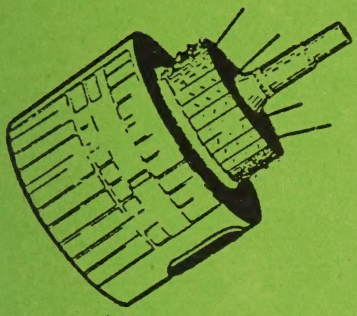
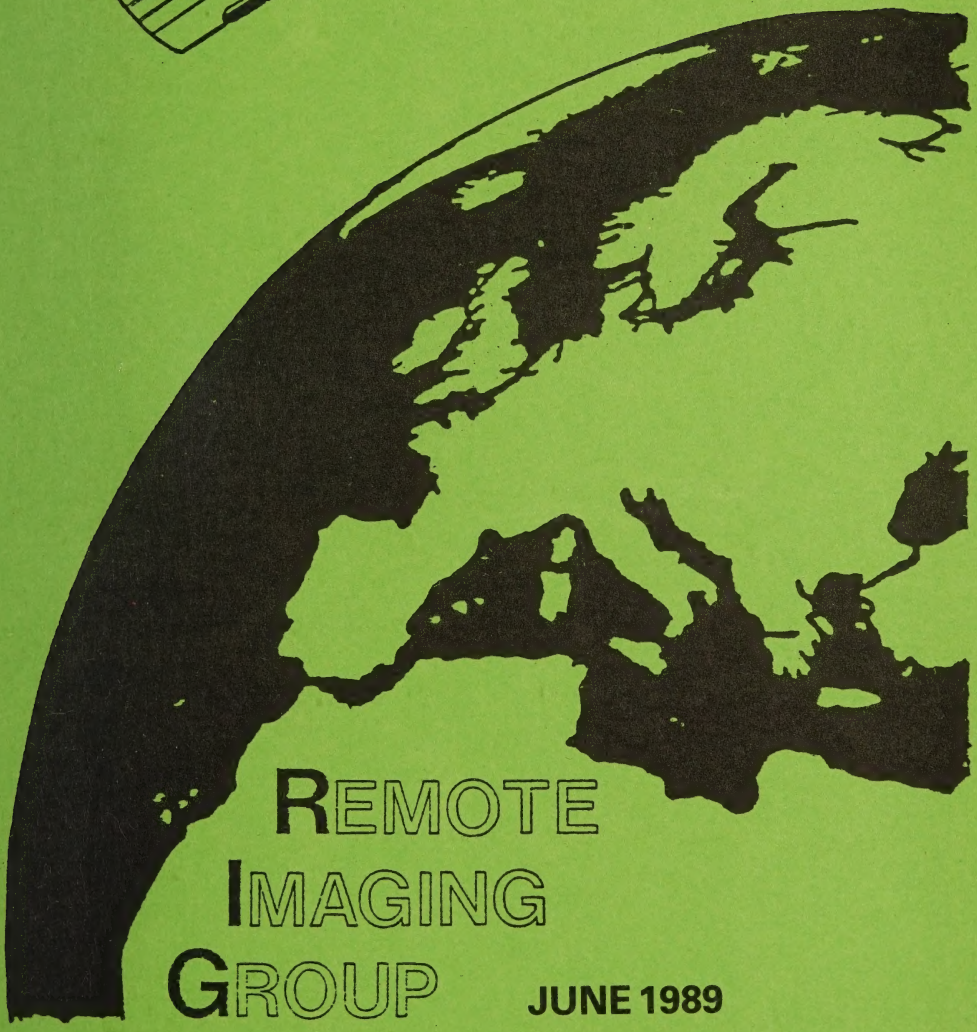
NEWSLETTER No. 17





REMOTE IMAGING GROUP

JUNE 1989

REMOTE IMAGING GROUP (R. I. G.)

NEWSLETTER No. 17 JUNE 1989

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Editorial and Secretaries page

Well I do hope you are all reading this in June as we have tried to bring the newsletter back on schedule.

This month we have an excellent article reprinted from the Journal of the Environmental Satellite Amateur Users' Group (JESAUG) produced by Greg Mengell in the USA.

John Dubois is the author, and the LNA design is part of a series of articles related to the requirements of receiving high resolution images. The systems are not for the faint hearted but they can be realised by the dedicated amateur. I can hear the requests coming in..... Yes, we will be publishing the other articles in subsequent issues, but we have been waiting on the availability of PCB's for the digital signal processing part(s)- watch this space!

The LNA is for 1.7 GHz and based on GasFet and MMIC technology. It will have a wide number of applications as it exhibits a very wide bandwidth as there are no tuned circuits to speak of. RIG is planning to provide UK sources for all the components - more in the next issue. The good news is that the claimed noise figure has already been achieved with the first UK built version. I wonder how long it will be before the design or something very similar creeps into the commercial market!!

Members who can recall the last issue will realise that this issue is smaller than the last. Not surprising as I am running short of material, so once again I ask the members to write in and tell the other members what you are doing. I've had several requests from new members for the most basic information to be presented as beginners articles. So perhaps some of the new members who have been through the mill would care to relate their experiences to the ones who are still thinking about it.

VHF Convention - I do hope those of you who visited the convention this year, had a chance to visit the stand and see the demonstration on the Apple MacIntosh II of the Dartcom software. We managed to persuade Ron Lindsay, who travelled all the way down from Newcastle for the event. Newcastle Computing Services market the product and I must say a big thank you Ron.

I'm just off on holiday, by the time I get back this should be published, so a short note from me this time, However a final plea for more input for the newsletter please....

Best Wishes
Phil

CHAIRMAN'S WAFFLE

I hope you all enjoyed the Annual General Meeting which was held at Sandown again this year. About the usual number attended, and everything went smoothly. With the exception of one committee member, the rest of us were re-elected for another year's hard work, which we all look forward to. We have at last appointed a Rally Organiser. He is Mike Coombs, an existing committee member who volunteered for the job. The best of luck Mike, it's not too bad when you get used to it. Perhaps our panics will be a little better organised now.

One thing you expressed your opinion on, at the AGM, was the length of the Chairman's Waffle. 110% actually read it ? There must be something wrong! Surely you don't want even longer ones. If these figures are confirmed we could lose a lot of members. You must be spared from an even worse affliction. I must get the committee to recheck the figures.

The rally at Sandown was notable for the number of trade stands displaying Weather Satellite Systems. Some were designed by members close to the committee. There are a few new well known names selling systems and who have taken up advertising space in our Newsletter. This must surely be a sign that membership will grow even further. Did you see the Macintosh system that was on the RIG stand at Sandown? It was indirectly from the Devon establishment and we all must secretly desire, anything of similar quality. It put our framestores in the shade with its all singing, all dancing capabilities. If only - if only? We can but dream of days to come, the trouble is they seem so far away at times.

I hope you all noticed the improvement in the centrefold pictures last time. They were printed by Prontoprint of Peterborough and we all thought they were very good. Since then we have been contacted by a member who does have experience in the printing field and he has suggested another company that does our kind of work. This company has sent us some excellent examples of Landsat images. If we can get that kind of quality repeated in the centre pages this time we shall have done well. As usual it's just a case of knowing.

Henry's little problem with the local planning department seems to have resolved itself. Perhaps they are reasonable humans that work in those places after all. Well I hope that the present proposals all mature as intended and then everybody will be happy. On a completely different issue, where someone was using Henry's property for something they didn't have permission to, right has once again triumphed over wrong. The pity is that it took 2 years or more to correct, that the legal profession had to be involved and that it ever happened in the first place. Still English justice works in the end.

Now come off it chaps, after the comment in RIG 16 p46 "having read the print off the pages" (Newsletters). They should be guarded with your life, you photocopy the originals and then place them in a very safe place, no not the smallest room in the building, in a location where nobody can get their grubby hands on them! You then read the print off the photocopies.. Any more suggestions like that and someone will get excommunicated or something equally painful.

I, on behalf of the group have been asked, by Jim Bacon to give a talk about "Satellite picture reception at home" at the Royal Meteorological Society October Meeting, held in conjunction with the RSGB at the Blackett Laboratory, Imperial College, London. I gather that most of the tickets are sold already, and no doubt there will be reports of this event in a later Newsletter.

One lunchtime I had an unexpected telephone call from Kurt Wenger HB9ROT in Switzerland offering to help me with a circuit diagram for my Tektronix 4631 Hard Copy Unit. Fortunately for me but unfortunate for Kurt, I had been sent one earlier. Still we had a nice chat and compliments where compliments are due, B.T. supplied us with a very good line, very little noise and near Hi Fi quality. Well it seemed like that after some of the lines we all have to put up with. Thanks for the call Kurt. While I'm on the subject of the 4631 I have studied the circuit etc very carefully and I am sure that I can do something with it, but I'm being very careful and planning it all out before getting the big sidecutters out. The system is all tied up in a special timing sequence, hence my caution. These units are a bit more numerous than I thought at first, keep your eyes open.

My comments on the letter in RIG 15 p70 had better not be published. Several of you have seen the results of using a Quad loop Yagi. The design given under my name works well and has been tested to verify the gain figures claimed. One thing that was noticed was that a boom correction figure was not included in the loop circumferences, which should be increased by 4-6mm. All systems should be used with short lead lengths and very low noise amplifiers, or direct into a DARTCOM downconvertor. At several rally's we have used my Quad Loop Yagi straight into the DARTCOM downconvertor with excellent results. It is difficult to measure the difference in gain between it and the group's dish. I usually conclude that they are similar considering that the dish was somewhat distorted (less than 1/4 wave excursion). I have now tried to reshape it back to its original curve. James Brown has built a Quad Loop Yagi and is very happy with it. Anne hopes that the other thing will now go!

We had a good attendance at the BATC rally at the new location of Coventry. It was a very pleasant setting, a little difficult to find initially, but after following my nose for a mile or so around the

rather large intersection I was about to ask for directions when this row of flag poles appeared on the horizon and I knew where to head. It was rather crushed to start with and very hot. As someone said "I didn't know I had so many friends". All the usual traders were there plus a few additional ones, add in the car boot men and you get quite a few more than usual. I thought that the quality or range of stuff (my wife calls it something else) was not up to the level of previous years (I didn't find what I was looking for), and we all now know that the treasurer (not ours) wouldn't buy any raffle tickets.

Ian Gurton has been busy constructing a new design of 1700Mhz preamp. It claims a 0.5db or better noise figure. It is relatively simple to construct but you must stick to the specified components. It is all contained in a very small box (57 x 34mm) and there are no large tuned lines as in other designs. Tuned circuits, if you can call them that are 3 turns of 30 SWG wire wound on a pin. Needless to say all lead lengths are very critical. The design is meant for high resolution systems and gives an overall gain of 36db. It consists of two GASFETS and a MMIC to finish with. I shall omit this last device otherwise my poor Liverpudlian downconvertor will have angina or something equally serious and she's all I've got! With the demise of many a GASFET at my QTH it will probably be the last attempt to handle these devices before being scared off completely!

I hear that MOP1 or Meteosat 4 as it will be known has a similar fault with it's antennae as Meteosat 3, this time there is only one dipole that has gone faulty. This information will hopefully be confirmed by ESA in due course. Perhaps next time the fault will be fully researched so that it doesn't happen again. It is sometimes wise to have that little bit extra to spare for just this type of situation. You just don't know when you might need it. Meteosat 3 I hear is getting its visa to go to the American area, as they are getting low on working spacecraft. Apart from the antennae fault it has served us well and we wish it a happy holiday before getting back to work again. I trust there will be no delays due to air traffic control problems.

I meant to mention in the last Newsletter, that the Meteosat 3 signal strength variations had really got me foxed. In the winter the signal varied in sympathy with daylight. When the last Newsletter was in the process of being printed I didn't know what to think was happening as the daylight time was rapidly increasing but my diurnal signal strength variation hadn't significantly changed. The ?onset of the reduced signal is still about 8am GMT but the recovery after noon is a fair bit slower. I had very bad dips around Noon GMT, especially on the 1,2,3,& 4 of May. During the 5,6,& 7 of May the weather hadn't significantly changed but the effect was only 40% of the previous 4 days.

Now by (mid May) the effect has changed slightly with the increased daylight time, but not to the same percentage. My mind still boggles ?at what the cause is. The fact that the signal to noise ratio doesn't seem to change much confuses the issue. However Lawrence Harris confirms that there is a variation.

It was very pleasant to hear from Lawrence on the telephone after reading about him in New Scientist two nights earlier. I had intended to check him up in the membership lists but had not had time to do so.

The ancillary data that you give us on the membership form is very useful and gives us early indication of any current trends etc. The article was a bit on the "Chicken wire gets Astra" level but as with all New Scientist articles, it gave considerably more detail than the normal tabloid press. I was somewhat chuffed and proud that one of our members had received the scientific press treatment. Keep up the good work Lawrence.

Well that's it for another Newsletter. Not so much as last time, but there we are. I gather from Phil that the Newsletter is a fair bit thinner this time, mainly due to the last one being late and having extra articles added as time went by. We have tried to get back to our official cover date this time, anyway Phil's going on holiday so if we don't wrap up now he won't get sunburnt!

All the best
Henry

Low Noise Amplifier for 1.7 GHz

(This article has been reproduced
by kind permission from the
JESAUG organisation in the USA)

This article describes a modest cost, low noise preamplifier for VAS, HRPT, WEFAX, GPS and radio astronomy which meets the most difficult requirements for amateur reception of these signals and can be built without expensive equipment. It delivers a minimum of 35db gain and will produce about 0.5 db noise figure which corresponds to 35 degrees K noise temperature. The usable bandwidth is from 300MHz to over 1800 MHz but noise figure is lowest between 1500 and 1800 MHz. It requires no tuning or adjustments to reach this performance and it is mechanically configured to mount outside at an antenna feedpoint. The following paragraphs describe the reason why this performance is necessary and to go on to construction details. At 1989 small quantity prices, the parts for this preampilifer will cost under 90 dollars.

Editors note: This project has already been built very successfully by one of our committee members. We are currently seeking UK based sources of these components (more next newsletter).

The high resolution digital image transmissions from GOES and TIROS (NOAA 9, 10 & 11) are an exciting challenge to the amateur remote sensing community. Receiving these transmissions and deriving the images requires patience and skill in RF and digital hardware as well as software but the results are well worth the effort.

Information and circuits are available for the first experimental systems which obtain these images in JESAUG issues 88-1 88-2 88-3. While the articles give sufficient details to reproduce the hardware, they intend to be a starting point for experimenters to expand and improve this frontier of amateur effort.

One of the hardest blocks to obtain to build for a GOES or TIROS digital system is the low noise amplifier (LNA). In either system, the reception with practical amateur antennas is not possible unless the LNA performance is extremely good. The LNA noise figure must be 0.8 db or lower (which corresponds to a noise temperature of 59 degrees K or lower) and the gain must be at least 30db. The reason for this is that with a practical sized dish antenna and typical RF downconvertor noise figure, anything less will not deliver an adequate signal to noise ratio from the demodulator. In a digital system, unlike WEFAX FM-AM analog transmissions, this doesn't result in a noisy image but instead no image at all because of a threshold effect similar to that experienced with weak signal FM reception.

Virtually all amateur LNA designs previously published for amateur microwave communications fall short of the requirement for gain of at least 30 db simultaneous with excellent noise figure. While the noise figure of previous designs is adequate, their gain is not. It must be high enough to over come noise produced by the second RF stage or the mixer. For example if a LNA has a noise figure of 1 db (75 degrees K) and a gain of 14 db then when used with a downconvertor which alone has a noise figure of 6 db (865 degrees K) the overall effective noise figure will be 1.4 (110 degrees K). This can be the difference between good images and no images for a given size antenna. A similar statement could be made for communications use where higher gain in the LNA can, under some conditions deliver substantially better results.

A notable exception to the previous decade of lower gain amateur GASFET LNA designs is to be found in the February issue of QEX (American Radio Relay League, 225 Main Street Newington CT 06111) where Paul Shuch N6TX has introduced the cascading of GASFET and MMIC (monolithic microwave integrated circuit). In this way, gain can be added to the excellent noise performance of the GASFET with much less difficulty from instability, which can arise out of discrete bipolar amplifier construction. The N6TX design using a single GASFET can reach a noise figure as low as about 1db using practical construction techniques and the Avantek ATF 10235 GASFET. Paul's analysis of the amplifier using computer modelling is extensive and shows the influence of the various circuit elements on overall performance.

In order to maintain the high gain and reach an even lower noise figure it is necessary to proceed to a two GASFET cascade before the MMIC for the same reason that a low gain LNA is not adequate in a system. The first stage will not have enough gain to completely overcome the second stage noise of anything besides another GASFET. However it is not a simple task to add another GASFET stage to good LNA "front end" design without causing instability. The isolation or reverse gain of the GASFET stage is not very good and two in cascade will do their very best to oscillate instead of just amplify. The source and load impedances seen by both GASFET stages must be adjusted so that the pair is stable under almost all conditions. Following these stages as in the Shuch design, MMIC's can be easily added to boost overall gain well beyond 30db. The two GASFET front end gain will be enough to completely over come the noise contribution of the MMIC'S and deliver very close to the specified noise figure of the input GASFET for overall noise.

The design presented here fulfils the requirements completely for digital VAS reception from GOES or HRPT reception from NOAA/TIROS. It operates from 12 volts dc and is capable of 0.5 db noise figure (35 degrees K and simultaneous 35 db gain.

It can be reproduced easily, requires no tuning or adjustment and is designed to mount right at the coaxial transition of a parabolic dish antenna feed and can be reasonably weather proofed. (A completely hermetic sealed modification would be quite practical). The gain is high enough to allow RG58 feeder cables up to about 35 feet and RG213 feeder cables up to about 75 feet. While designed for VAS and HRPT this LNA will be of great use also for WEFAX where its high specifications will improve the performance of any existing system.

In addition its bandwidth is large enough to receive GPS (Global Positioning System) satellite transmissions at 1545 MHz and amateur radio astronomers will find it useful in the same region.

For example using this LNA and a typical "coffee can" feed horn and an accurate 10 foot parabolic dish reflector signals from the GOES VAS transmission on 1687.1 MHz can give us as high as 18db carrier/noise ratio. This is ample for noise free pictures. Similarly using a similar but circular polarised and a 4 foot parabolic dish HRPT signals on 1698 MHz can yield a 20 db C/N ratio also quite adequate for good images.

The schematic diagram is given in figure 1. It is a straight forward three stage design. The first two stages are GASFET transistors for the reasons described above. The third stage is a moderately low noise MMIC to provide overall gain. The GASFET are source biased for simplicity and device protection and are powered from a 5 volt IC regulator. The MMIC is powered from the raw 12 volt supply through a 510 ohm biasing resistor. Series inductors are used in the matching network at each gate and simple moulded chokes are used for gate dc return. Interstage impedance matching is provided by networks L3 C4 and L6 C8.

As with any microwave circuit the schematic is only part of the design since the physical dimensions of construction are significant fractions of an electrical wave length. The circuit board layout in figure 2 therefore, is actually part of the schematic and the parts placement drawings in figure 3 is important in maintaining wiring impedances expected in the design. For example the source leads of U1 and U2 should not be cut short but extended to the bypass capacitors as shown in figure 3 because of their inductance is required in the circuit.

The enclosing Pomona box and input/output arrangement have been designed so that the preamplifier can easily be mounted right at the antenna feed. It is intended that the assembled preampilifer be mounted upside down, that is, with the Pomona box bottom facing up so rain water does not hit the PC board directly.

The input coax will then extend directly to the feed connector and the output coax will easily run at a right angle to the preamplifier with a "U" bend to force the box away from the feed assembly. (this is the reason for using a right angle SMA connector at the output). Do not solder shut all or the plated through holes in PC board ground plane. By leaving them open there is a path for humid air to escape and avoid condensation build up inside the box. (Ed's note: John doesn't know about our English weather!!)

This design must be honestly described as considerably stable. That is, it will exhibit some spurious oscillation if the source impedance magnitude is far from 50 ohms. Although this is usually considered a defect, in the present case it really is not. The reason is that the optimum source impedance for lowest noise is near 50 ohms and if the antenna is not presenting somewhere near this to the preamplifier, overall performance will be well below the best that is possible. It can also mean that there is a serious problem with the antenna and or its feed assembly. The conditionally stable property of the preamplifier is therefore, actually a kind of diagnostic function which will confirm that the antenna and feed are reasonably OK. This is not an extremely sensitive or "touchy" property of the preamplifier, as long as the antenna and feed are presenting somewhere near the right source impedance, you will never know about it.

The coil L7 is optional for the purpose of bringing 12 volt dc power supply into the preamplifier via the coaxial RF output cable. If you have the proper circuit to feed 12 volts onto this cable at the downconvertor or receiver, then L7 can be used and a separate 12 volt cable avoided. If you do not have any way to put 12 volts onto the coax and if the downconvertor input is not dc isolated, then DO NOT INSTALL L7 because its presence can possibly damage the downconvertor or receiver.

A final issue is the so called "idiot diode". This is a series diode placed in the dc supply line of many preamplifier designs just after the feed through capacitor. Its purpose is to prevent circuit damage if dc power is accidentally hooked up backward. It is a fairly good idea, but there is some possibility that such a diode will rectify very large RF signals in the vicinity and actually add to the supply voltage. In any event if you feel nervous about inadvertently hooking up the supply voltage backwards, you can put in 1N4002 in series with the 12 volt supply before connecting to R4,C10 and U4.

A complete parts list is given in table one. It is quite important not to substitute any other devices for the transistors, MMIC or capacitors. There are many kinds of chip capacitors and this circuit expects the porcelain type for best noise performance. The inductors are not extremely critical as long as they are wound neatly using the specified wire and resistor and drill forms which pretty well tie down their size and shape.

Do NOT remove the GASFETS U1 and U2 from their package until ready and to install them as directed below. First make a hole for the power feed through capacitor C12. There is no hole provided in the PC board for this capacitor because of the variability of diameter in different types you might use. Drill a clearance hole for the one you have adjacent to the SMA output connector as shown is figure 3, using care not to get it to close to this connector. Do not install C12 however, until the chip capacitors are mounted, so that the board will lie flat on the work bench.

Next solder the chip capacitors C1,C2,C3,C4,C5,C6,C7,C8, and C9 to the board, each (except C9) in a vertical position. Use as little heat as possible but try to assure a uniform flow of solder under the capacitor and leave it standing square and vertical. This is a little tricky to do but use patience, hold the capacitor gently with the pliers and apply heat around the base of the capacitor while watching for flow of the solder. After the solder flows keep the iron at the base, square the position, seat firmly to the board and finally remove the iron. Continue holding the capacitor untill the solder cools. Be sure not to confuse the 100pf and 5.6pf values, keep them separate until ready to install them. C9 should be soldered flat on the board with its contacts between the pc foil segments. Be careful not to solder bridge C9 to the ground post of the SMA output connector. Now install the feedthrough capacitor C12. Solder it on BOTH sides of the board and do not install a nut. Try to be sparing with the solder but get a complete flow around the capacitor.

Now put the SMA output connector in place on top of the pc board pointing along the long side outward toward the closest edge of the board and solder the 5 pins underneath. Then solder the connector shell to the pc foil on the top side of the board. Try to be sparing with the solder but get a complete flow around the shell. Now install the 78L05 regulator (U4) and tantalum capacitors C10 & C11. Be sure to observe the orientation of the flat side of the 78L05. It goes upside down but vertical against the component side of the pc board with its leads sticking up before connection. The flat side of the 78L05 faces in toward the middle of the board.

Check polarity of the tantalum capacitors, plus goes away from ground. The ground lead of C10 should be bent over and soldered to the middle lead of U4.

Now install the MMIC U3. Be sure to orient it properly before soldering, the white dot is the input and the body should extend up from the back of the board. (since the ground leads are symmetrical, it won't be catastrophic if installed upside down as long as the input white dot is correct)

Now install L4,R1,R2,R3, and R4 exactly as shown in figure 3. The end of R1,R2,R3,R4 touching vertical capacitors are soldered to the top of these capacitors, the ends touching ground are soldered flat to the pc ground foil and the excess lead cut off. Keep all these leads as short as possible while still touching their connection points. R2 goes exclusively between two capacitors and R4 goes from the centre pin of C12 to the short pc foil pad shown. This will leave U1,U2,L2,L3,L5 AND L6 UNINSTALLED.

Wind these inductors (L2,L3,L5 and L6) at this time if you haven't yet. Prepare L2 and L5 so that they have a tinned lead at both ends about 1/32 inches long extending straight out axially from the coil. L3 and L6 should be prepared similarly except with the tinned leads (of the resistor) about 1/8 inch long. Make absolutely sure the solder has flowed onto the coil wires at the junction of the resistor wires for L3 and L6. The enamel on the wire takes a while to burn off and allow solder to flow, these junctions will require a LOT of heat. You may need to practice forming L2 and L5. When finished they should be very neat, cylindrical in shape and have their tinned leads coming off squarely along the coil axis. There can be up to about 1/4 wire diameter separating the turns, but no more. It is easiest to form the coil first and then tin the ends. The tinning here too will require a LOT of heat to burn off the enamel. Make sure the tinning is completely around the ends and uniform.

The GASFET transistors will be installed next and must be handled very carefully to avoid electrostatic discharges which could destroy them. Make sure your soldering iron and preferably table top are grounded. Wear cotton clothing, sit down and make contact with your hands between the pc board, your soldering iron and the GASFET transistor package to get them all at the same potential. Then carefully open their package and remove one transistor at a time. The gate (input) lead is cut at a diagonal on its end, then drain (output) lead is 180 degrees opposite to the gate and the two source leads are at right angles.

Place the source leads on top of the vertical source capacitors (C1,C2 for U1 and C6,C7 for U2) like standoffs with the body midway between and the gate lead extending toward the input components and quickly solder the source leads to the top of the capacitors. Solder the drain (output) lead to the top of vertical capacitor C4 (for U1) and C8 (for U2) and cut off any excess extending beyond the capacitors. Hold the inductor L2 (or L5) in place between the gate lead and its other connection point to judge how much needs to be trimmed from the gate lead and tinned inductor lead ends. When soldered in place the inductor should lie in a straight path between the gate lead and the input, without angling up or down ie. a straight line path. Now cut the gate lead (it will be about 1/8 inch) and solder L2 (for U1) and L5 (for U2) in place.

Now solder L3 (for U1) and L6 (for U2) from the top of capacitors C3 (for U1) and C5 (for U2) respectively to a point on the drain lead of U1 and U2 between the body of the GASFET and the solder junction on vertical capacitors C4 (for U2) (for U1) and C6.

The LNA input requires a special explanation as there is no input connector on the pc board at all. Instead, a short length of RG402 teflon semi-rigid coax is stripped back at one end to expose about 1/32 inch of centre conductor. The coax is inserted through the board so that this stub of centre conductor extends out the component side and the jacket is soldered to the ground on BOTH sides of the board so it is just flush on the component side. The length of this piece of RG402 may be cut so that it just reaches the connector on your antenna feed but it should be kept between the approximate limits of 0.5 and 1.5 inches. A male SMA connector (P2 in the parts list) is then soldered at the antenna end of this coax. This arrangement produces a very low loss input.

If you try to use cutters on RG402 they just squash it and make it an unusable mess. RG402 is stripped and/or cut by scoring the outer jacket with a knife and then gently wiggling it until the copper jacket breaks at the score. Then cut straight down through the insulation to the centre conductor with a knife. To peel back some jacket repeat this procedure a little way back from the free end but only cut through the teflon as far as the centre conductor. The jacket and teflon insulation piece can then be pulled off the free end. Before soldering either end of the coax piece, clean the copper jacket with some sand paper for easy solder flow. Also be careful about pulling on the centre conductor, with this short length it is easy to pull it completely out of the jacket.

After assembly is complete, use some alcohol and soft brush to clean all the solder flux off of both sides side of the pc board.

The flux itself is not harmful, but it can attract moisture and conductive contaminants after a period of time. Install all four screws to hold the pc board, as the top of the box (aluminium top supplied by Pomona is not used) and you are done. There is no adjustment or tuning to put the preampilifer into operation. Double check all your connections against the schematic and parts and layout drawings. Then connect to a source of + 12 volts on the top side of the power feed through capacitor C12, and return ground on the top pc foil.

The circuits should draw about 20 milliamperes at 12 volts If you have the facility to do a gain and/or noise figure check, it can be done at this time otherwise connect between the antenna and receiver for use.

It is possible to optimise noise figure only if you have the proper equipment. The adjustment is to vary the length of the coil lead between L2 and U1 gate. This can be done by leaving the gate lead slightly long and soldering L2 at various points along the lead. However the effect is very small and is strongly discouraged unless you have very good test equipment.

TABLE 1: Parts List

U1, U2	NEC-72084
U3	MMIC, MAR-6
U4	78L05
R1,R3	220R 5%
R2	10R 5%
R4	510R 5%
L3,L6	1000R see L3,L4 description
C1,C2,C3,C4	
C6,C7,C9	100PF Porcelain chip capacitor
C4,C8	5.6pf " " "
C10,C11	1uf 35 volt tantalum
C12	1,000 pf feedthrough
L1,L4	.33 microhenry moulded choke
L2,L5	3 turns 26swg enamel copper wire Close wound on No. 55 drill (0.052"dia.)
L3,L6	3 turns 28 swg enamel copper wire close wound on 1k Ohm 1/8 watt resistor. The resistor becomes part of the coil. Solder ends of wire close to resistor body.

L7 15 turns 28 swg enamel copper wire
Close wound on No. 55 drill (0.052inch)
- air spaced.

P1 Right angled SMA pcb connector

P2 SMA input connector,
solder type for RG402/U

Input co-ax RG402/U

Box Pomona PN2428 ITT

PCB John Dubois has offered these
but RIG try to organise a UK source
either in bulk from John or locally

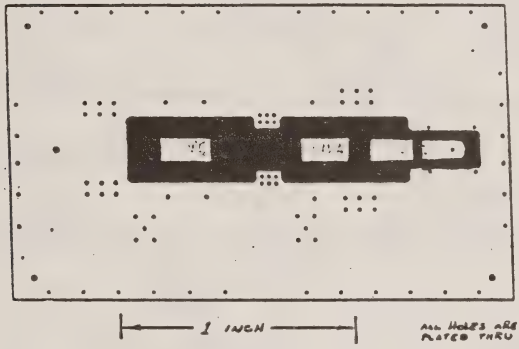


Fig 2

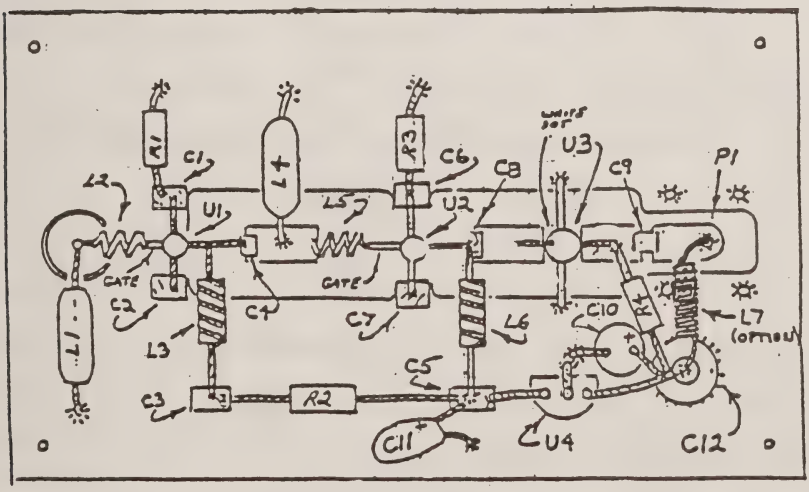


Fig 3

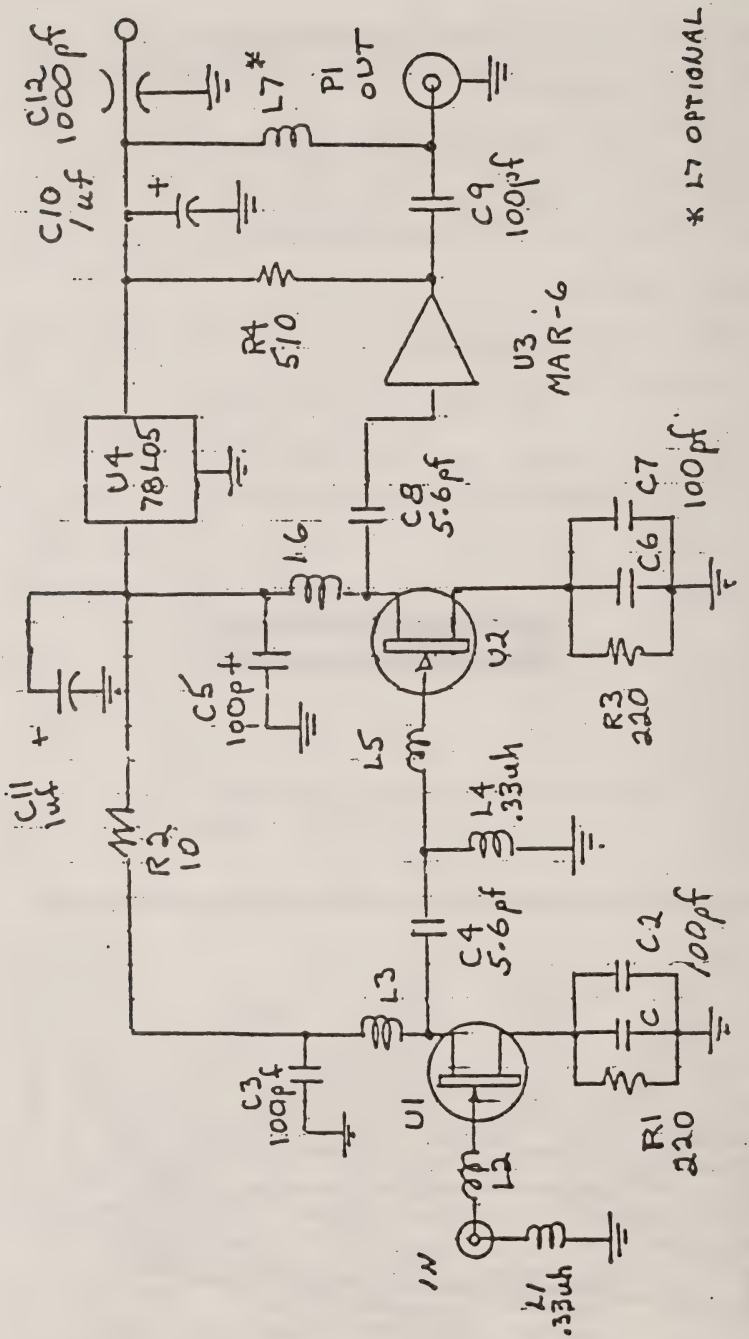


Figure 1

NB See constructional notes on p43

STATION PROFILE - North of the border

The following is the history and a follow up of the satellite receiving station at Kirkintilloch.

The station is in the Forth and Clyde valley, situated some 8 miles North East of Glasgow. The station elevation is 200 feet, and the antennas are some 40 feet above ground level. Hills of 1000 to 1300 feet stretch from the Northwest to the Northeast, some 3 to 5 miles away, with a 700 foot hill 3 miles to the west, and a 750 foot hill 3 miles to the east.

I first started printing the satellite images with an old Muirhead D649-D radio facsimile 18 inch recorder of 1965 vintage.

The satellite signals from the polar orbiting satellites were received at first on an old receiver that I bought second hand. This was about 1975, when the ESSA-8 satellite was going strong. This satellite used to take a still picture of an area of the earth and then rebroadcast it to the user on the 137 MHz band

Now with the new series of "Real Time Satellites" one can now follow the satellite over its track.

Before the crossed dipoles became fashionable, I used two antenna rotators to give me azimuth and elevation facilities to track the satellite. The antenna was a 5XY for 2 metres from Jaybeam. The signals were as you would expect, very strong. Even with the antenna at only 10 feet above ground level, I got quite a distance South which was amazing as this 35 foot house I live in was blocking my Radio view. I then invested in a 10XY for 137 MHz from Jaybeam. This antenna was very long (13 feet), and a bit cumbersome.

The only trouble I had then, was that the fax recorder was copying visible pictures OK, but the Infra-red pictures were inverted (black clouds and white sea !!). I tried to solve this problem, but never did. I did not want to tamper with the fax recorder as I used it for Offenbach's long wave transmissions.

In the winter months, I did get some nice Infra-red pictures (the correct way round) but at the expense of losing the visible ones.

After a while, I saw in a copy of VHF COMMS, that the crossed dipole was giving good results. So, I took the beam down and remounted the driven elements and reflectors on a separate mast. This mast was some 35 feet above sea level. That system worked very well, with good reception from the Canary Islands to Northern Greenland.

I later purchased one of the Jaybeam crossed dipoles and bought the 10 XY beam back into service, this allowing me to receive some of these passes that are below 10 degrees elevation at best.

My main interest is in Meteorology, and I felt that I would like a more regular stream of pictures. This is when I found out that Meteosat 2 (which had just been launched a few months previous) could with its format be just what I wanted. I then bought a microwave modules 1691/137 MHz converter. A friend had by this time built up a 137MHz FM receiver from the VHF COMMS design. For Meteosat reception, I needed some sort of dish, and after thumbing through a few Rad-Coms, I found a fellow Radio amateur over towards Edinburgh selling a 4 foot one. This also had a tripod. So, both were purchased, and pressed into service. I later found out that due to the grey colour of the dish that it was off a gunnery radar from a ship. It is a heavy dish and really needs two to lift it, being made from fibre-glass. The horn feed was from an old "Quality Street" tin with a small monopole inserted. The pictures were taken on the 18 inch fax machine. The signal strength was almost fully quieting, so I improved this signal strength with the microwave modules 1694 MHz pre-amp mounted besides the converter.

I then purchased one of Guy Martin's 9 inch fax recorders and with the aid of a "Black Box", which was built to operate the start/stop control, and also set the contrast level, the satellite images were very good, with no noise at all on the system.

As the fax paper grew steadily more and more expensive, I found that Frame stores were becoming more popular.

I purchased the parts with the help of a few people, built up the YU3UMV framestore.

I found that the VHF COMMS receiver jumped frequency at times, so when I joined the Remote Imaging Group, I saw that Dartcom had the type of receiver that I really wanted.

For a black and white monitor, I went the full hog and bought one of the 12 inch models that R.S. sell for their security system .

So, the station was fully operational. Good pictures from the NOAA'S and METEOSAT, with some of the Russian Satellites thrown in for good measure.

During the second half of 1987, Meteosat 2 started getting noisy at night. No proper solution could be found, except that during January and February 1988 the noisy period was around 1500 GMT during May.1988 the noisy period was around 1000 GMT.

The noise period seemingly is due to the satellite drifting off my dish heading and lasts for about 3 hours in total. After the 3 hours, I can sit and watch the needle on the S meter slowly climb back to it's normal position.

During late 1987 the real headache arrived, when I was tuned into any of the orbiting satellites, I found an intermittent blanketing carrier on the frequencies. I traced this carrier, which came on and off at regular intervals to 138.075 MHZ. It sure was strong. With a R-1000 receiver and a 136/138 Microwave Modules converter, it was dbs, I had by this time got the 10XY Yagi to a new height of 45 feet. I tried this antenna and beamed to the west, where there is a prime site for radio on a 700 foot hill. The signal was 60 dbs over S9 with 20 dbs of attenuation. I found out after talking to Les Currington, that the signal was a Mercury Communications paging outfit. A radio amateur in Bearsden, a few miles north of Glasgow, had been watching on his spectrum analyser, and said that he had never seen such a strong signal.

I then got on to Dartcom, who suggested sending the receiver back for mods to be carried out. I did this and when the receiver came back, the problem had gone. When using crossed dipoles, there is no break through at all. With the beam, there is some slight break-through but you have to be beaming in the direction of the source (west in my case), and as I said with the signal strength that I was getting on the R-1000 with the 28/137MHz converter, it would be very difficult, keeping these signals out, without greatly narrowing the bandwidth of the receiver and degrading the quality of the picture.

Now with good sunlight over this part of the earth in the spring and summer months, there are some really good images from NOAA 9 to be seen in the afternoons, so I looked for a suitable tape recorder to record the signals while I am at work. The small cassette machines with ALC built in, are really quite useless as a thin black line appears across the picture when the satellite receives the white minute marker on top of the black block.

I finally tracked down a inexpensive tape recorder that fits the bill. It is the Sanyo RD22 which cost me 45 pounds. This has an input level control, but no output control. That can be adjusted by using the gain control on the framestore. The recorder takes Metal Chrome and normal tapes. It has 3 digit mechanical counter and also a dolby facility.

The keys on the tape recorder are very good and positive to operate. The normal cassettes do for the visible pictures but I found that they produce a lot of tape "Dropout" mainly seen on the Infra-red images.

These look like black scratches on the picture. Buying the TDK SA-X tapes helped a great deal, but watch out these tapes are very expensive at near 3 pounds for a C90.

I also have a local noise that can trigger the receiver if the squelch is not turned far enough back. To over come this problem, I use a digital time switch to allow the tape recorder to come one minute before and shut off one minute after the pass.

I have tracked this noise to a faulty insulator on a 11 Kv line some 1.5 kilometres away. I have contacted the electricity Board for help on this problem, and they have promised to check the line within the next two weeks. I located this problem with the aid of the 10 XY beam. I found out what direction the noise was coming from and looked for noisy transmissions lines . I found the fault quite easily with the aid of a small airband portable. The interference puts black wavy lines on the top of the satellite image when the satellite is below 20 degrees (approx).

Over the years and using different antennas, I now know that my image receiving area stretches from 85 degrees North to 28 degrees North and from Novava Zemyla and the Kara Sea in the Barents Sea (N Russia) to the Caucasas Mountains and at times to see the North-western side of the Caspian Sea. Turkey and Egypt is also possible, along the north Libyan Desert on the Eastern passes, to the Gulf of the St Lawrence up the main land of Labrador, over the Hudson Strait to Northern Baffin land on the Western passes.

With the beam antenna, these low lying passes can be easily seen with good resolution. During January and February the Infra-red images of Newfoundland were very good, these images taken on the last of the NOAA 10 passes for the day. I did manage to see quite a way down the St Laurence River on the satellite image.

My future plans are to try and get the images onto a IBM compatible when funds allow, and try to store the image on disc. Colour would be a bonus.

Interpreting the image takes a bit of know how, and along with the surface charts from Offenbach's long wave transmission using the fax-1 unit, one can get the complete analysis of the weather.

After reading the article in the Rig Newsletter about receiving pictures from GOES-5, I dragged the dish out of it's usual place for Meteosat and faced it to the WSW. The signal was there, but very weak. I then carried the dish to the front of the house, this being done on a day with a gusty SW wind.I can verify that dishes take some wind loading, while carrying the dish, a gust of wind about 35 mph caught me.

I managed to stay upright, but that dish suddenly weighed some 5 times HEAVIER.

I got the converter and receiver set up, and by just holding the dish about 5 feet above ground level, I got a noise free signal. A few days later when the wind dropped I set the dish up again at the front of the house and took GOES-5 for a full afternoon. I started at 1245Z with a noise free and stronger signal than Meteosat 3 but by 1400Z the signal was getting noisy. It stayed that way until I took the system down at 1730Z. The weather was drizzly and I do have a 80 foot high church to the west of me. The images are super with Australia and New Zealand seen. It was well worth the effort. To regularly receive this satellite and bearing in mind that a dish at the front of the house is not on due to the gales we get here. I am planning to try the Maplin loop yagi on the roof with the pre-amp, and put the converter into the loft. From the roof there is a superb view to the west. I will let you know what happens in a later issue.

Angus McGugan

L N A PARTS KIT

There is a strong possibility that we will be able to supply a comprehensive kit of parts to those of you wishing to construct this item. We anticipate being able to supply the 2 GASFETs, the very small chip capacitors, the board, a short length of UT141,the 78L05 and possibly other items at a similar price as you would have to pay for just the 2 GASFETs. The two GASFETs would be supplied to us already sealed and we would just have to add the other special components to complete the kits. I have not used the MMIC myself but this could also be supplied at an additional cost. For further details contact Ian Gurton tel 05827 3770 7.30pm -9.30pm or write to him at

28 Bloomfield Road
Harpenden
Herts
AL5 4DB

Results measured on an "EATON" noise gain analizer are as follows

1300Mhz	37.74 db	gain	1.0 db	noise	figure
1550Mhz	38.05 db	..	0.85 db	..	..
1680Mhz	35.92 db	..	0.3 db	..	..
1694Mhz	36.26 db	..	0.35 db	..	..

RTSAT - A SATELLITE TRACKING PROGRAM
by Theo Henggeler HB9SCJ

When I first got my IBM compatible AT-computer, I wondered what to do with it.....(Ed's note: Good marketing eh?).

I talked it over with a couple of fellow hams at a meeting of our local amateur radio club and HB9SCJ mentioned a satellite tracking program he had written. Since this seemed a good starting point for the virgin disk of my AT I decided to get this program and give it a try. I was very impressed when I loaded it and run it without any problems for the first time!

What are its features?
They are:-

It runs on any IBM or compatible with a graphic card 640*200 or EGA (the display is monochrome)

It calculates the orbits of 8 satellites simultaneously

The orbital data of these 8 satellites are displayed in a table (fig1) or shown on a world map (fig2)

One of the stored satellites can be shown above its sub-satellite point with the globe moving underneath; the visibility horizon, depending on the satellite height is also displayed (fig 3).

A view of the earth from directly above the station with the visibility horizon of a selected satellite can be displayed with the "footprints" of the satellite in real time (fig 4) including the calculated Doppler shift.

Included in the package is a program for the orbit predictions (called UOSAT) and an editing program for the reference Keplerian data (called KEPLER). This last program has an unique feature:
The data can be input via the serial data port of the computer in two formats :-
a) AMSAT format
b) NASSN format.

The software automatically detects the data corresponding to the stored satellites and up dates the reference values by its self! So, no more error prone typing of dozens of ten digit numbers .....

Sound's great? It is! The only draw back I noticed so far is the fact that one has to quit one program to start one of the others and that it is not in colour.....

The package comes personalised i.e. the compiled software already contains the call sign and station longitude and latitude. However, it is possible to change these values by means of a menu anytime you wish. It is easy to copy it for as many friends with your name and call sign in it?
Remember the price is only 65 Swiss Francs! Theo accepts Euro cheques in Swiss currency and mails the disk within 2 weeks ppd!

As I recently learned Theo is working on the program in several areas:-

Improved user friendliness (menus)

Translation of the program prompts in English

Colour display

Whatever the user wishes as long as it's reasonable.....

If you are really keen on this super program and want to order it here is Theo's address

Theo Henggeler HB9SCJ
Wyssenschwendi
CH 6314 Uterageri
Switzerland.

Figure 1

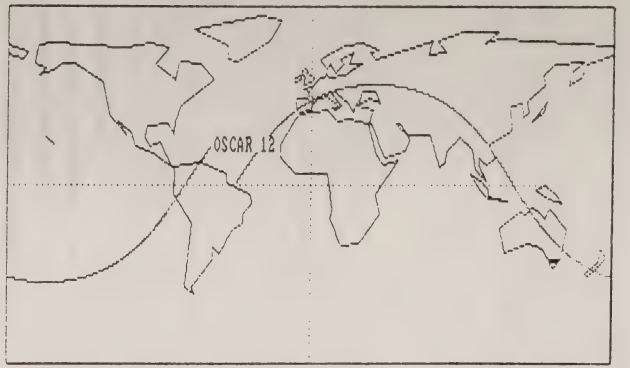
HB9SCJ Mittwoch 02.09.87 07:00:35

Name	Umlauf	L	B	AZ	EL	MA		DS	Bake
OSCAR 9	32853	343.4	66.7	9.3	1.8	140.3	^*	3460	145.825
OSCAR 10	3174	313.3	22.1	115.8	36.6	227.8	*	1031	145.810
OSCAR 11	18697	203.9	81.2	6.1	-18.8	162.7			
OSCAR 12	4798	161.9	39.9	352.7	-40.5	1.2			
) RS 10/11	974	265.5	-42.1	123.6	-56.0	123.3			
MET 2-12	13061	328.9	58.4	41.3	15.6	189.2	*	-1877	137.400
MET 2-13	8510	117.6	-80.5	192.7	-69.8	214.6			
NOAA9	14020	315.5	80.6	9.4	-6.6	70.2	^		

[T]=TABELLE [W]=WELT [G]=GLOBUS [D]=D-SHIFT [R]=R-DATEN [Q]=QUIT

Figure 2

HB9SCJ Mittwoch 02.09.87 16:07:07



[T]=TABELLE [W]=WELT [G]=GLOBUS [D]=D-SHIFT [R]=R-DATEN [Q]=QUIT

Figure 3

HB9SCJ

Mittwoch 02.09.87 12:17:32

Satellit: OSCAR 12

Bahnhoehe: 1495.5 Km

[T]=TABELLE [W]=WELT
[G]=GLOBUS [D]=D-SHIFT
[R]=R-DATEN [Q]=QUIT

Figure 4

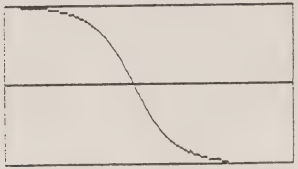
HB9SCJ Mittwoch 02.09.87 14:34:41

Satellit: OSCAR 12

Bahnhoehe: 1487.5 Km
Distanz: 3537.0 Km

Azimut: 69.5
Elevation: 11.2

Bakenfrequenz: 435.797 MHz
Dopplershift: -7804 Hz



[T]=TABELLE [W]=WELT [G]=GLOBUS [D]=D-SHIFT [R]=R-DATEN [Q]=QUIT

The Russian and Chinese Satellite Scene

by Les Currington G8LOK

June is not the best possible month to raise any enthusiasm about pictures from Russian Meteors. With the absence of snow and land detail over Europe, the most interesting pictures are to be seen around the Greenland area where most of the Arctic region is in full sunlight most of the day. Very impressive pictures of the ice breaking up near the East Greenland coast are to be seen on a clear day.

At the time of writing 23rd May the snow covered peaks of Norway are very evident also the Gulf of Bothnia is completely free of ice.

A Chinese report from Hong Kong on April the 18th admitted that Feng Yung 1 developed technical trouble on the 39th day after launch and the cloud charts transmitted to Earth were no longer identifiable. Details of the technical trouble are still unknown, it is speculated that in the course of manufacture, the satellite was tainted with dust causing a problem in the stabilising system of the satellite monitoring instruments.

China has initially decided to launch another Meteorological Satellite next year.

METEOR 2/16 87-68A 137.4 MHz

Excellent signals were received on the mid morning descending pass on the 21st May; most of Europe was cloud free, The Alps and Pyrenees showing up like ground markers.

METEOR 2/17 88-05A 137.4 MHz

This Meteor is now in early afternoon passes. G Perry on an early morning listening session heard a change from IR to visible at 07.20 hrs gmt on the 23rd May. With most of the Northern Hemisphere in maximum sunlight very little Meteor IR is seen.

METEOR 2/18 89-18A 137.3 MHz

Now in early morning descending pass good pictures free from any streaking.

METEOR 3/2 88-64A 137.85 MHz

Meteor 3/2 appears to be in hide and seek mode, several weeks of excellent pictures both IR and VIS and then nothing, only to reappear a few weeks later with a new period.

Meteor 3/2 made 2 orbit changes in April. On April the 11th it lowered its period from 109.41 minutes 1209 Km to 109.14 minutes 1198.7Km.
During April 14th it again raised its period to 109.4 mins 1210.2Km. The reason for this is obscure, as the change is so small to hardly effect orbital plane spacing between Meteor 3/02 and the other Meteors. Because the ground tracks change so rapidly any adjustment is pointless.
However, on the 22nd May excellent pictures were obtained on an early morning pass at 07.17 gmt showing the thunder storms we had just experienced in East Anglia in great detail.

OKEAN 1 88-56A 137.4 MHz

No signals have been heard from Okean for several weeks any reports would be welcome.

KEPLER ELEMENTS provided by Max White ROYAL GREENWICH OBSERVATORY, HERSTMONCEAUX CASTLE

A couple of apologies from the editor:

The REV numbers were not included (as far as I could see!) in the data received.

Some elements have a reduced number of decimal places. Due to pressure I've not had time to discuss these with Max. I'm sure we will be back to normal next time.

	NOAA 9 137.62 MHz 84-123 A	MET 2-17 137.30 MHz 88-05 A
EPOCH OF DATA	89120.091792	89121.260325
ACCELERATION	0.00000637	0.00000190
REV NO		
INCLINATION	99.141	82.544
R. A. NODE	106.100	317.859
ECCENTRICITY	0.001650	0.001836
ARG OF PERIGEE	88.162	42.630
MEAN ANOMALY	272.143	317.627
MEAN MOTION	14.1197682	13.8414960
SEMI MAJOR AXIS		

	COSMOS 1766 137.4 MHz 86-55 A	NOAA 11 137.62 MHz 88-89 A	NOAA 10 137.50 MHz 86-73 A
EPOCH OF DATA	89120.845301	89121.401463	89117.949567
ACCELERATION	0.00001924	0.00000724	0.00000757
REV NO			
INCLINATION	82.524	98.935	98.640
R. A. NODE	81.737	65.645	149.393
ECCENTRICITY	0.002142	0.001279	0.001452
ARG OF PERIGEE	252.201	9.223	39.881
MEAN ANOMALY	107.684	350.917	320.342
MEAN MOTION	14.7499892	14.1096679	14.2296416
SEMI MAJOR AXIS			

	MET 2-18 137.3 MHz 89-18	MET 2-16 137.4 MHz 87-68 A
EPOCH OF DATA	89121.414036	89115.399527
ACCELERATION	0.00000117	0.00000219
REV NO		
INCLINATION	82.532	82.552
R. A. NODE	196.490	261.354
ECCENTRICITY	0.001561	0.001252
ARG OF PERIGEE	86.602	351.125
MEAN ANOMALY	273.692	8.966
MEAN MOTION	13.8379114	13.8345634
SEMI MAJOR AXIS		

	OKEAN 137.4 MHz 88-56 A	MET 3-02 137.3 MHz 88-64 A
EPOCH OF DATA	89120.823392	89121.010461
ACCELERATION	0.00002047	0.00000391
REV NO		
INCLINATION	82.519	82.547
R. A. NODE	180.392	209.022
ECCENTRICITY	0.002362	0.001606
ARG OF PERIGEE	30.660	263.397
MEAN ANOMALY	329.591	96.531
MEAN MOTION	14.7459989	13.1692260
SEMI MAJOR AXIS		

Reference Orbits for Russians Satellites
prepared by Dick Boardman

These are the times of north-going equator crossings(in GMT) and longitudes (in degrees west) for four Russian satellites.
They are given at weekly intervals together with the period and the change in longitude per orbit.

MET 2-16 137.4 MHz

Period 104.158 minutes increment 26.21degrees

20MAY	1:32 18	27MAY	0:11 10	2JUN	22:49 2	9JUN	23:12 20
16JUN	21:50 12	23JUN	20:29 4	30JUN	19: 7 356	7JUL	19:29 14
14JUL	18: 7 6	21JUL	16:46 358	28JUL	17: 9 16	4AUG	15:47 8
11AUG	14:24 0	18AUG	14:47 18	25AUG	13:26 10	1SEP	12: 4 2

MET 3-02 137.3 MHz

period 109.413 mins increment 27.46degrees

20MAY	20:53 356	27MAY	20:39 4	3JUN	20:24 12	10JUN	20:10 21
17JUN	18: 6 1	24JUN	17:52 10	1JUL	17:37 18	8JUL	15:34 359
15JUL	15:19 7	22JUL	15: 5 15	29JUL	13: 1 356	5AUG	12:47 4
12AUG	12:32 12	19AUG	12:19 21	26AUG	10:14 1	2SEP	10: 0 10

MET 2-17 137.3 MHz

period 104.103 minutes increment 26.19degrees

20MAY	4:52 7	27MAY	3:26 358	3JUN	3:43 15	10JUN	2:17 6
17JUN	0:50 356	24JUN	1: 8 13	30JUN	23:42 4	7JUL	22:14 355
14JUL	22:32 12	21JUL	21: 6 2	28JUL	21:23 19	4AUG	19:57 10
11AUG	18:31 0	18AUG	18:48 17	25AUG	17:22 8	1SEP	15:55 359

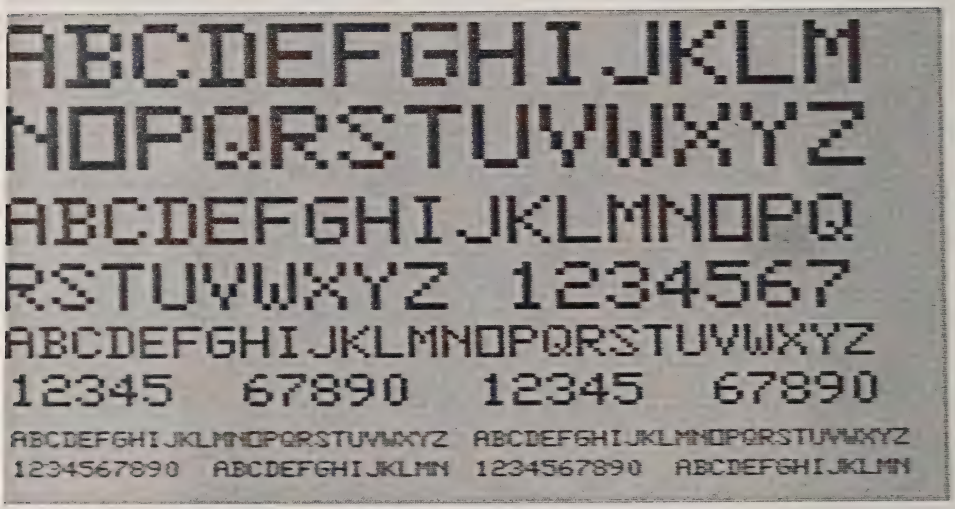
MET 2-18

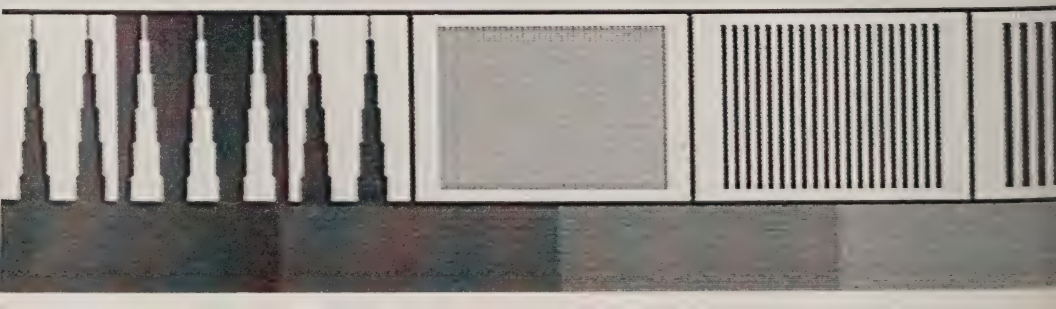
period 104.12 mins increment 26.16 degrees

20MAY	20:47 8	27MAY	19:23 359	3JUN	19:42 17	10JUN	18:17 8
17JUN	16:53 0	24JUN	17:13 17	1JUL	15:49 9	8JUL	14:25 0
15JUL	14:45 17	22JUL	13:21 9	29JUL	11:57 0	5AUG	12:17 17
12AUG	10:53 9	19AUG	9:29 0	26AUG	9:49 18	2SEP	8:25 9

euro

ag


ABCDEFGHIJKLM
NOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQ
RSTUVWXYZ 1234567
ABCDEFGHIJKLMNOPQRSTUVWXYZ
12345 67890 12345 67890
ABCDEFGHIJKLMNOPQRSTUVWXYZ ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 ABCDEFGHIJKLMN 1234567890 ABCDEFGHIJKLMN



CHANNEL A2 (1694.5)

HH	12			15				18				21			
CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2
E2	23	..	..	C7D	29	WEFA	4	E3	35					WEFA	6
		..	..	CTH	0	..	..					CTH	0	..	..
D2	24	BIVW	24	D2	30	BIVW	30	D2	36	BIVW	36	D2	42	BIW	42
C02	24			C02	30			D1	36			D1	42		
C03	24	AIVH	24	C03	30	AIVW	30	D3	36	AI	36	D3	42	AI	42
D1	24	..	..	D1	30	..	..	D4	36	..	..	D4	42	..	..
D3	24	..	..	D3	30	..	..	D5	36			D5	42		
D4	24	DTOT	24	D4	30	DTOT	30	D6	36	DTOT	36	D6	42	DTOT	42
D5	24	LY	25	D5	30	LY	31	D7	36	LY	37	D7	42	LY	43
D6	24	CTOT	24	D6	30	CTOT	30	D8	36	ETOT	36	D8	42	ETOT	42
D2	25	BIV	25	D2	31	BIV	31	D2	37	BIV	37	D2	43	BIW	43
C02	25	LR	25	C02	31	LR	31	D9	37	LR	37	D9	43	LR	43
C03	25	AIVH	25	C03	31	AIVH	31	D1	37	AI	37	D1	43	AI	43
C3D	25	..	..	C8D	31	..	..	D3	37	..	..	D3	43	..	..
C3D	25	..	..	C9D	31	..	..								

HH	13			16				19				22			
CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2
C1D	25									WEFA	5			LXI	43
										..	..				
D2	26	BIVW	26	D2	32	BIVW	32	D2	38	BIVW	38	D2	44	BIW	44
C02	26			C02	32			D1	38			D1	44		
C03	26	AIVH	26	C03	32	AIVH	32	D3	38	AI	38			AI	44
D7	26	..	..	D7	32	..	..	E1	38	..	..			..	..
D8	26	..	..	D8	32	..	..	E2	38						
D9	26	LXIV	25	D9	32	LXIV	31	E3	38	LXIV	37			AW	44
D3	26	..	..	D3	32	..	..	E4	38	..	..			..	..
								E5	38						
D2	27	BIV	27	D2	33	BIV	33	D2	39	BIV	39	D2	45	BIW	45
C02	27	LZ	25	C02	33	LZ	31	D1	39	LZ	37	D1	45		
C03	27	AIVH	27	C03	33	AIVH	33	D3	39	AI	39	D3	45	AI	45
		..	..			..	..	E6	39	..	..			..	..
D3	27	..	..	D3	33	..	..	E7	39						

HH	14			17				20				23			
CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2
C1D	27			C1D	33	AW	33	E8	39	AW	39				
C2D	27			C2D	33	..	..	E9	39	..	..				
D2	28	BIVW	28	D2	34	BIVW	34	D2	40	BIW	40	D2	46	BIW	46
C02	28			C02	34			D1	40			D1	46		
C03	28	AIVH	28	C03	34	AIVH	34	D3	40	AI	40	D3	46	AI	46
C3D	28	..	..	C3D	34	..	..			..	..			..	..
C4D	28	..	..			..	..								

TEST	0	ADMIN	0	ADMIN	0	TEST	0	TEST	0	ADMIN	0	ADMIN	0	TEST	0
D2	29	BIV	29	D2	35	BIV	35	D2	41	BIW	41	D2	47	BIW	47
C02	29			D1	35			D1	41			D1	47		
C03	29	AIVH	29	D3	35	A1	35	D3	41	AI	41	D3	47	AI	47
C5D	29	..	..	E1	35	..	..			..	..	E1	47	..	..
C6D	29	..	..	E2	35							E2	47		

UPPRESSION DUE TO SEASONAL UNDERILLUMINATION

NOAA '10' PERIOD 101.24721945 MINS INCR 25.312123442 DEG

29/07	189	08:09	29/08	343	18:26	30/09	188	08:06	31/10	343	18:24
29/07	341	18:16	30/08	186	07:56	30/09	340	18:14	1/11	185	07:54
30/07	183	07:46	30/08	338	18:03	1/10	183	07:43	1/11	337	18:01
30/07	335	17:53	31/08	332	17:41	1/10	335	17:51	2/11	332	17:38
31/07	355	19:12	1/09	352	19:00	2/10	354	19:10	3/11	351	18:57
1/08	349	18:50	2/09	346	18:37	3/10	349	18:47	4/11	346	18:35
2/08	343	18:27	3/09	188	08:07	4/10	343	18:25	5/11	188	08:05
3/08	186	07:57	3/09	340	18:15	5/10	185	07:55	5/11	340	18:12
3/08	338	18:05	4/09	183	07:45	5/10	337	18:02	6/11	183	07:42
4/08	332	17:42	4/09	335	17:52	6/10	332	17:40	6/11	334	17:50
5/08	352	19:01	5/09	354	19:11	7/10	351	18:58	7/11	354	19:08
6/08	346	18:38	6/09	349	18:48	8/10	346	18:36	8/11	348	18:46
7/08	189	08:08	7/09	343	18:26	9/10	188	08:06	9/11	343	18:23
7/08	341	18:16	8/09	186	07:56	9/10	340	18:13	10/11	185	07:53
8/08	183	07:46	8/09	338	18:03	10/10	183	07:43	10/11	337	18:01
8/08	335	17:53	9/09	332	17:41	10/10	335	17:51	11/11	332	17:38
9/08	355	19:12	10/09	352	18:59	11/10	354	19:09	12/11	351	18:57
10/08	349	18:49	11/09	346	18:37	12/10	349	18:47	13/11	346	18:34
11/08	343	18:27	12/09	188	08:07	13/10	343	18:24	14/11	188	08:04
12/08	186	07:57	12/09	340	18:14	14/10	185	07:54	14/11	340	18:12
12/08	338	18:04	13/09	183	07:44	14/10	337	18:02	15/11	182	07:42
13/08	332	17:42	13/09	335	17:52	15/10	332	17:39	15/11	334	17:49
14/08	352	19:00	14/09	354	19:10	16/10	351	18:58	16/11	354	19:08
15/08	346	18:38	15/09	349	18:48	17/10	346	18:35	17/11	348	18:45
16/08	189	08:08	16/09	343	18:25	18/10	188	08:05	18/11	343	18:23
16/08	340	18:15	17/09	186	07:55	18/10	340	18:13	19/11	185	07:53
17/08	183	07:45	17/09	337	18:03	19/10	183	07:43	19/11	337	18:00
17/08	335	17:53	18/09	332	17:40	19/10	334	17:50	20/11	332	17:38
18/08	355	19:11	19/09	352	18:59	20/10	354	19:09	21/11	351	18:56
19/08	349	18:49	20/09	346	18:36	21/10	349	18:46	22/11	346	18:34
20/08	343	18:26	21/09	188	08:06	22/10	343	18:24	23/11	188	08:04
21/08	186	07:56	21/09	340	18:14	23/10	185	07:54	23/11	340	18:11
21/08	338	18:04	22/09	183	07:44	23/10	337	18:01	24/11	182	07:41
22/08	332	17:41	22/09	335	17:51	24/10	332	17:39	24/11	334	17:49
23/08	352	19:00	23/09	354	19:10	25/10	351	18:58	25/11	354	19:08
24/08	346	18:37	24/09	349	18:47	26/10	346	18:35	26/11	348	18:45
25/08	189	08:07	25/09	343	18:25	27/10	188	08:05	27/11	343	18:22
25/08	340	18:15	26/09	186	07:55	27/10	340	18:12	28/11	185	07:52
26/08	183	07:45	26/09	337	18:02	28/10	183	07:42	28/11	337	18:00
26/08	335	17:52	27/09	332	17:40	28/10	334	17:50	29/11	331	17:37
27/08	354	19:11	28/09	351	18:59	29/10	354	19:09	30/11	351	18:56
28/08	349	18:49	29/09	346	18:36	30/10	348	18:46	1/12	346	18:34

All morning passes are southbound, evening passes are northbound.

Frequency 137.50MHz. INCRement is degrees change per orbit.

NOAA '11' PERIOD 102.109813545 MINS INCR 25.526738359 DEG

29/07 345 12:51	28/08 343 12:43	27/09 188 02:23	26/10 341 12:39
30/07 189 02:28	29/08 187 02:20	27/09 341 12:36	27/10 185 02:16
30/07 343 12:41	29/08 340 12:33	28/09 185 02:13	27/10 339 12:28
31/07 187 02:17	30/08 185 02:10	28/09 338 12:25	28/10 183 02:05
31/07 340 12:30	30/08 338 12:23	29/09 182 02:02	28/10 336 12:18
1/08 184 02:07	31/08 182 01:59	29/09 336 12:15	29/10 333 12:07
1/08 337 12:20	31/08 335 12:12	30/09 333 12:05	30/10 331 11:57
2/08 181 01:57	1/09 332 12:02	1/10 330 11:54	31/10 354 13:29
2/08 335 12:09	2/09 330 11:51	2/10 353 13:26	1/11 351 13:18
3/08 332 11:59	2/09 355 13:33	3/10 351 13:15	2/11 348 13:08
4/08 355 13:30	3/09 353 13:23	4/10 348 13:05	3/11 346 12:57
5/08 352 13:20	4/09 350 13:12	5/10 345 12:54	4/11 190 02:34
6/08 350 13:09	5/09 347 13:02	6/10 189 02:31	4/11 343 12:47
7/08 347 12:59	6/09 345 12:51	6/10 343 12:44	5/11 187 02:24
8/08 344 12:48	7/09 189 02:28	7/10 187 02:21	5/11 340 12:36
9/08 189 02:25	7/09 342 12:41	7/10 340 12:33	6/11 185 02:13
9/08 342 12:38	8/09 186 02:18	8/10 184 02:10	6/11 338 12:26
10/08 186 02:15	8/09 340 12:30	8/10 337 12:23	7/11 182 02:03
10/08 339 12:28	9/09 184 02:07	9/10 182 02:00	7/11 335 12:15
11/08 183 02:04	9/09 337 12:20	9/10 335 12:12	8/11 333 12:05
11/08 337 12:17	10/09 181 01:57	10/10 332 12:02	9/11 330 11:54
12/08 181 01:54	10/09 334 12:10	11/10 330 11:52	9/11 355 13:37
12/08 334 12:07	11/09 332 11:59	11/10 355 13:34	10/11 353 13:26
13/08 331 11:56	12/09 355 13:31	12/10 352 13:23	11/11 350 13:16
14/08 354 13:28	13/09 352 13:20	13/10 350 13:13	12/11 348 13:05
15/08 352 13:17	14/09 349 13:10	14/10 347 13:02	13/11 345 12:55
16/08 349 13:07	15/09 347 12:59	15/10 345 12:52	14/11 189 02:32
17/08 346 12:56	16/09 344 12:49	16/10 189 02:29	14/11 342 12:44
18/08 344 12:46	17/09 188 02:26	16/10 342 12:41	15/11 187 02:21
19/08 188 02:23	17/09 341 12:38	17/10 186 02:18	15/11 340 12:34
19/08 341 12:36	18/09 186 02:15	17/10 339 12:31	16/11 184 02:11
20/08 185 02:12	18/09 339 12:28	18/10 184 02:08	16/11 337 12:23
20/08 338 12:25	19/09 183 02:05	18/10 337 12:20	17/11 181 02:00
21/08 183 02:02	19/09 336 12:18	19/10 181 01:57	17/11 334 12:13
21/08 336 12:15	20/09 334 12:07	19/10 334 12:10	18/11 332 12:02
22/08 333 12:04	21/09 331 11:57	20/10 331 12:00	19/11 355 13:34
23/08 331 11:54	22/09 354 13:28	21/10 354 13:31	20/11 352 13:24
24/08 353 13:25	23/09 351 13:18	22/10 352 13:21	21/11 350 13:13
25/08 351 13:15	24/09 349 13:07	23/10 349 13:10	22/11 347 13:03
26/08 348 13:04	25/09 346 12:57	24/10 346 13:00	23/11 344 12:52
27/08 346 12:54	26/09 190 02:34	25/10 344 12:49	24/11 188 02:29
28/08 190 02:31	26/09 343 12:46	26/10 188 02:26	24/11 342 12:42

All morning passes are southbound, afternoon passes are northbound.

Frequency 137.62MHz. INCRement is degrees change per orbit.

METEOSAT DISSEMINATION SCHEDULE S8906M01 CHANNEL A1 (1

GMT HH 00 03 06 09

MM	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH
2	E2	47							E3	11	WEFA	2	C7D	17	
6					CTH	0					..	..	CTH	0	
10	D2	48	BIW	48	D2	6	BIW	6	D2	12	BIVW	12	D2	18	BIV
14	D1	48			D1	6			C02	12			C02	18	
18	D3	48	AI	48	D3	6	AI	6	C03	12	AIVH	12	C03	18	AIV
22	D4	48	..	..	D4	6	..	..	D1	12	..	..	D1	18	..
26	D5	48			D5	6			D3	12	..	..	D3	18	..
30	D6	48	DTOT	48	D6	6	DTOT	6	D4	12	DTOT	12	D4	18	DTO
34	D7	48	LY	1	D7	6	LY	7	D5	12	LY	13	D5	18	LY
38	D8	48	ETOT	48	D8	6	ETOT	6	D6	12	ETOT	12	D6	18	CTO
42	D2	1	BIW	1	D2	7	BIW	7	D2	13	BIV	13	D2	19	BIV
46	D9	1	LR	1	D9	7	LR	7	C02	13	LR	13	C02	19	LR
50	D1	1	AI	1	D1	7	AI	7	C03	13	AIVH	13	C03	19	AIV
54	D3	1	..	..	D3	7	..	..	C3D	13	..	..	C8D	19	..
58									C2D	13	..	..	C9D	19	..

GMT HH 01 04 07 10

MM	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH
2			LXI	1			LXI	7	C1D	13	LXI	13			LXI
6															
10	D2	2	BIW	2	D2	8	BIW	8	D2	14	BIVW	14	D2	20	BIVW
14	D1	2			D1	8			C02	14			C02	20	
18	D3	2	AI	2	D3	8	AI	8	C03	14	AIVH	14	C03	20	AIVH
22			..	..	E1	8	..	..	D7	14	..	..	D7	20	..
26					E2	8			D8	14	..	..	D8	20	..
30			AW	2	E3	8	AW	8	D9	14	AW	14	D9	20	AW
34			..	..	E4	8	..	..	D3	14	..	..	D3	20	..
38					E5	8									
42	D2	3	BIW	3	D2	9	BIW	9	D2	15	BIV	15	D2	21	BIV
46	D1	3			D1	9			C02	15			C02	21	
50	D3	3	AI	3	D3	9	AI	9	C03	15	AIVH	15	C03	21	AIVH
54			..	..	E6	9	..	..			..	..			..
58					E7	9			D3	15	..	..	D3	21	..

GMT HH 02 05 08 11

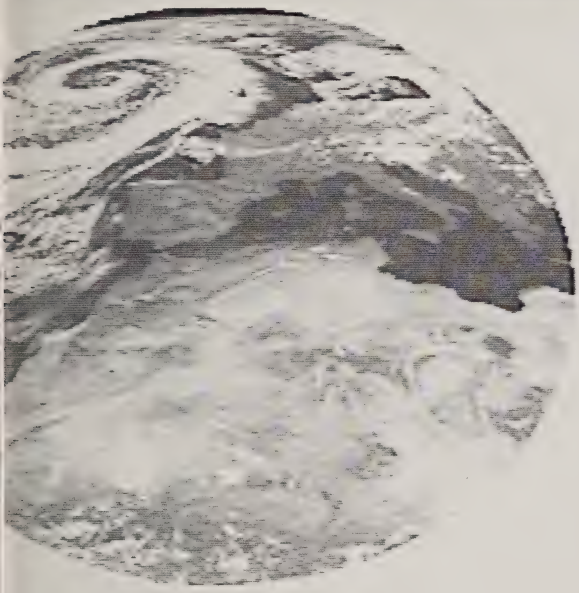
MM	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH	A2	CH	A1	CH
2			WEFA	1	E8	9			C1D	15	WEFA	3	C1D	21	
6			..	..	E9	9			C2D	15	..	..	C2D	21	
10	D2	4	BIW	4	D2	10	BIW	10	D2	16	BIVW	16	D2	22	BIVW
14	D1	4			D1	10			C02	16			C02	22	
18	D3	4	AI	4	D3	10	AI	10	C03	16	AIVH	16	C03	22	AIVH
22			..	..			..	..	C3D	16	..	..	C3D	22	..
26									C4D	16	..	..			..
30															
34															
38	TEST	0	ADMIN	0	ADMIN	0	TEST	0	TEST	0	ADMIN	0	ADMIN	0	TEST
42	D2	5	BIW	5	D2	11	BIW	11	D2	17	BIV	17	D2	23	BIV
46	D1	5			D1	11			C02	17			C02	23	AV
50	D3	5	AI	5	D3	11	A1	11	C03	17	AIVH	17	C03	23	..
54			..	..	E1	11	..	..	C5D	17	..	..	E1	23	..
58					E2	11			C6D	17	..	..	E2	23	..

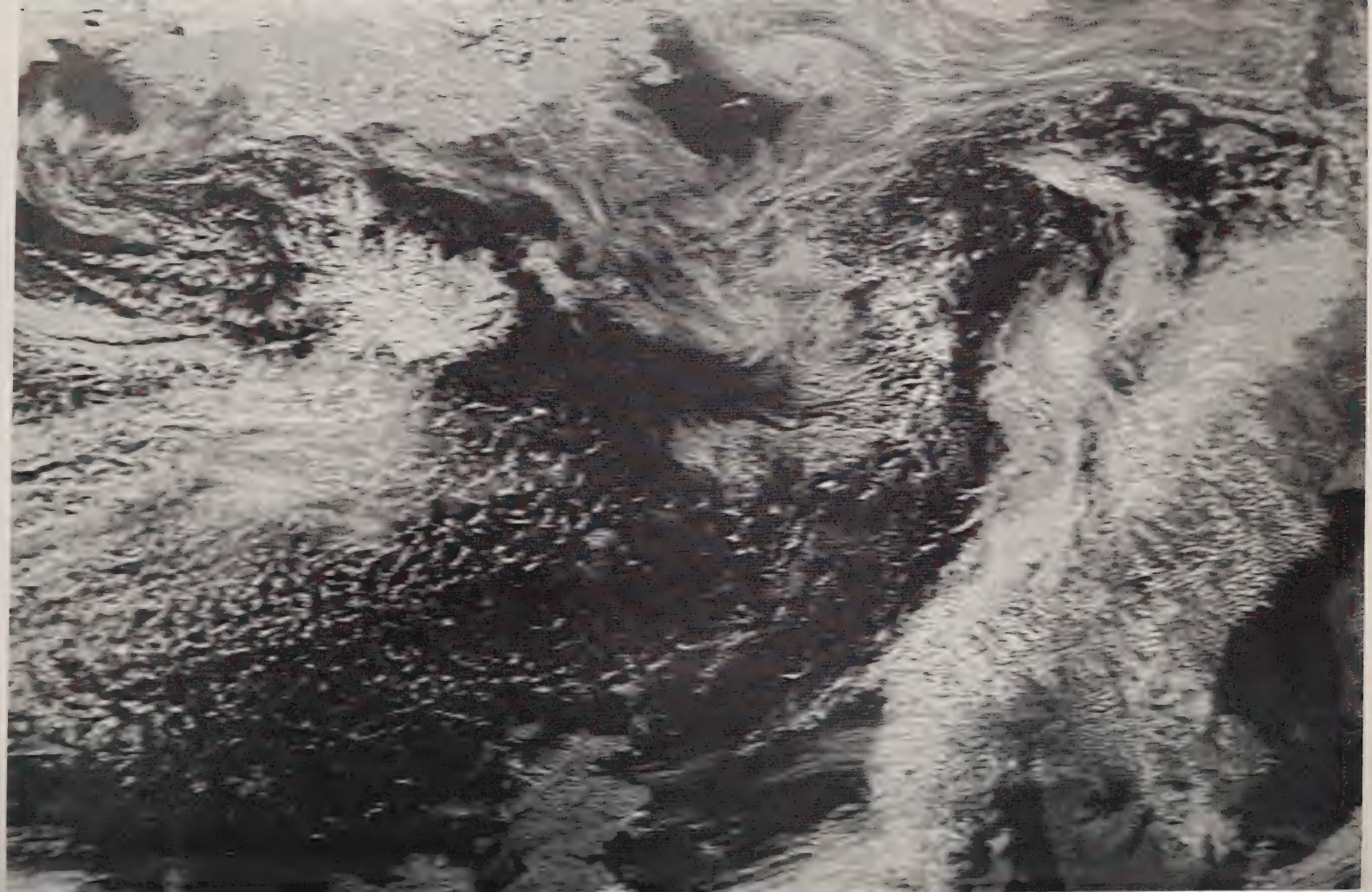
SOME VISIBLE IMAGE FORMATS ARE SUBJECT

ean space agency
nce spatiale
ropéenne

METEOSAT

OPERATIONAL PROGRAMME





HIGH RESOLUTION PICTURE TRANSMISSIONS
by Bob Sansoni

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) ADVANCED TIROS-N SERIES (ATN) OF REMOTE IMAGING SPACECRAFT.

NOAA-H or NOAA 11 is the eighth in the series of the TIROS-N spacecraft. The first in the generation was launched on the 13th of October 1978 at 11.23 GMT and was the protoflight for the follow on series.

The latest spacecraft NOAA-H carries a considerable payload of instruments and experimental packages, which are all available VIA the Digital Transmissions on the "S" band TIP (TIROS Information Processor) DATA.

These include:

Search and Rescue (SAR)
This package was initiated on NOAA 8. SAR is the operational use of a space borne receiver system to track and locate existing Emergency Locator Transmitters (ELT's) on 121.5 MHz and 243 MHz. (approx 150,000 units). The new spacecraft also carries an improved version operating on 406 MHz, providing global coverage.

Solar Backscatter Ultraviolet Spectral Radiometer (SBUV)
The SBUV/2 was flown on NOAA 9 previously. Sensors measure solar irradiation from backscattered Solar energy in the spectral range of 160-400 nanometers. From these measurements the Earths total Ozone concentration in the atmosphere can be determined to an accuracy of better than 1 percent "NOAA".

TIROS Operational Vertical sounder system (TOVS)
This system contains three independent instrumentation packages.
1. Stratospheric Sounding unit (SSU)
Measures the temperature of the upper atmosphere (25-50 km) by radiance measurements using a three channel gas filled cell.
2. High Resolution Infrared Radiation Sounder (HIRS/21)
Measures the temperature in the atmosphere to constructed a vertical profile down to 40 Kilometres.
3. Microwave Sounding Unit (MSU)
Measures the temperature in the atmosphere to construct a vertical profile down to 10 Kilometres.

ARGOS/DATA COLLECTION SYSTEM (DCS)

There are over 2000 Data Collection Platforms world wide consisting of Buoys, Free floating Balloons and Remote Weather Stations, all measuring temperature, pressure, rainfall etc. They transmit this data at regular intervals. The DCS package, receives, records time, frequency and forwards the information on to the appropriate ARGOS station for further processing of information.

Advanced Very High Resolution Radiometer (AVHRR)

This is the instrument package which supplies the five channels of raw digital data, with a resolution of 1.1 Kilometres. Transmission of this data takes place on the "S" band along with all the other TIP data on either 1698 MHz or 1707 MHz*. The baseband bit rate is 665.4 kilo bits per second and is phase shift keyed modulated.

The AVHRR provides direct read out of the five channels to High Resolution Picture transmission users. Transmissions at a reduced resolution (4 kilometres) is provided for Automatic Picture Transition* users on 137.620 MHz (VHF) at a 2 KHz baseband using AM/FM Modulation. There is also a facility on board to store and forward AVHRR data for local area coverage of selected portions of each orbit at 1.1 km resolution.

Characteristics:

channels	1	2	3	4	5
Spectral range (micrometers)	0.58-0.68	0.72-1.0	3.55/3.93	10.3/11.3	11.4/12.4
Resolution km	1.1	1.1	1.1	1.1	1.1
Scan angle (degrees)	+/-55	+/-55	+/-55	+/-55	+/-55

Optics-8 inch diameter Cassegrain telescope.
Scanner- 360 RPM hysteresis synchronous motor.
Data output- 10 bit binary, simultaneous sampling at 40 KHz.

The following is a general description of the authors AVHRR receiving equipment, which has been in use for over nine months. This station is a simplified version to provide imaging data from digital transmissions.

It is not intended to provide a standard to achieve, only a sample of what can be built, tested and used in a simple approach to the design of a AVHRR receiver system.

1. Tracking and Acquisition of signal (AOS) times are difficult to determine to within a 10 second period and 1 degree accuracy, whilst searching the horizon with the 1.5 meter antenna manually. I generally use the RIG predictions for the day and monitor the VHF transmitter until the usual 2.4 KHz tone is heard. Once this has been done for the day, it is not really necessary to check again for two days for an accuracy of 10 seconds.

2. ANTENNA Currently a 1.5 meter dish (ex-sat tvro Ku-band) on an azimuth/elevation mount is used to facilitate man handling the antenna. With this dish size and the following LNA, it is possible to receive noise free results from approximately 30 seconds after AOS of the VHF transmissions, which will provide good images of North Africa, Tripoli, Gibraltar and the Black Sea. Although if given the choice and space I would certainly opt for a larger dish as they now seem to be dropping in price quite substantially, and the more gain realised here will help considerably in the following sections.

3. Low Noise Amplifier (LNA) A two stage amplifier providing over 29db gain at less than 0.7db noise figure is realised. This is built on the wave guide feed assembly mounted in the prime focus of the antenna. The probe or receiving element should be right hand circular polarised, or if a linear feed is used, you will lose 3db. This noise figure is not now as difficult as it once was to achieve. The cost of the devices should not be more than 10 pounds each. (see the LNA article on page 7 - Ed)

4. Filter. The data has a band width of 5.7 MHz centred on the transmit frequency of 1707 MHz. This combined with the relatively low output of the satellite (approx 5 watts) requires a very well designed filtering system to limit noise and recover the data. Compare this bandwidth to the 40 KHz on 137 MHz.

5. Receiver. The entire receiver and demodulator containing all the filtering, Local Oscillators, Amplifiers and conditioners fit neatly on a PCB 15 inches by 14 inches. Numerous designs have been published on the design and construction of the receiver and demodulators including Wireless World November 1981 by M L Christianson. The de-modulator must be able to recover the 665.4kbit/s Phase Shift Keying. The receiver in use produces a LOCK indication to the received data by means of a analog ac component voltage which is monitored by an AVO meter along side the dish antenna for tracking. Tracking the satellite requires practice to keep the antenna within a 1 degree accuracy on pointing.

6. Software/PC. As I have only a 512 pixel by 512 line and 256 levels and 2 frame stores for the storage and display of any image, it is only possible to select and store a small portion of any one pass in full resolution. For example, if every pixel and line from channel one (Vis-1) is stored and Frame*1 and every pixel and line from channel two (Vis-2) is stored in Frame*2. Then an area the size of Southern Spain will fill the entire screen, or Southern England. However you can of course display every 4th or 10th pixel line for reduced resolution, taking in a larger area, some what resembling a APT image.

The Advanced Very High Resolution Radiometer has given some of the most impressive land and ice details second only to Landsat or SPOT. The images are able to detect/depict very small land contours often missed in the other transmissions. Another area of interest is the use of the other sensors ie. channel 3 and channel 4 and comparing these to the same land area as seen by channel 1. (Vis-1).

Satellite Remote Sensing by Ray Harris documents the ways the sensors are combined for various applications including -

(a) Determining water surface temperature.

(b) " land temperature

(c) " cloud temperature

(d) " Vegetation growth

(e) " Water/Moisture content in the soil

Receiving and processing data in its original form (Digital values from the sensor) certainly has its advantages. It is however some what more tricky to capture. We hope to reproduce a number of Meteosat HRPT images and NOAA images in the next RIG newsletter for members interest.

MINUTES OF THE ANNUAL GENERAL MEETING

OF THE REMOTE CONTROL GROUP.

Held on the 16th April 1989
At the RSGB VHF Convention

prepared by Dick Boardman

AGENDA

Chairmans Report
Secretary's Report
Treasurer's Report
Election of officers
A O B

Chairmans Report

The chairman reported that the group had had a successful year. The number of paid up members was over 1000 for the year up to 31/12/88 and over 800 of these had already renewed in 1989. On past experience this will result in a total of more than 1000 members in 1989.

The group has had a stand at 5 exhibitions in 1988

Financially the group was in good order, with the cost of the newsletter being met from subscriptions and a reasonable trading surplus being made on the sale of various items to support the groups activities.

There were some difficulties. The current issue of the newsletter was late and would not reach members until after the AGM.

We were running out of back issues of some of the early newsletters and reprinting them would be too expensive.

We had run out of dishes for Meteosat reception and any future supplies would be again more expensive.

The group is trying to make itself independent of equipment owned by individual members and is about to purchase its own laser printer. This will cost nearly 2000 pounds which will be met from the funds of previous years.

The chairman drew member's attention to the help page at the end of the news letter and asked members to ring the appropriate person for information rather than writing letters.

The chairman concluded by thanking members for all their support in the past year and hoping it would continue.

Secretary's Report

The secretary reported that it had been a busy year for weather satellites. A new American satellite was now in place,several Russian satellites had been launched and a Chinese satellite had transmitted pictures for a short time.

The newsletter had contained orbital predictions for all these satellites and members had successfully received pictures from them. The news letter had steadily increased in size with contributions from an increasing number of members. Phil emphasised that the content of the news letter was controlled by the members themselves and that almost all of the articles originated within the group. He appealed for the supply of articles to continue.

The group is about to purchase a laser printer and some desk top publishing software to go with it .He hoped that this would improve the presentation of the news letter.

The secretary said that his correspondence was now almost up to date and apologised for some delays that have occurred earlier in the year.

Treasurer's Report

The treasurer presented the audited Accounts for the year shown at the end of this report. He explained that the cost for the newsletter dated December 1987 were included in the 1988 accounts which is why the news letter cost seemed to exceed income from subscriptions. There had been a delay in cashing some cheques earlier in the year and some cheques had needed to be re-validated. However, no money had been lost as a result.

Election of Officers.

The chairman said that under the groups constitution,the AGM elected a committee and that the committee elected its own officers. All the current committee members with the exception of Peter Brazier were willing to be re-elected. He therefore requested that the meeting reelect the remaining members en bloc. This was agreed unanimously. Henry recorded his thanks to Peter Brazier for the work he had put in while serving on the committee.

Any Other Business

The chairman invited question from the floor.
(the minutes sec, apologies for not knowing members names)
A member asked whether the new laser printer could be hired. Phil said he would look into that.

Several members inquired whether they could access any American Bulletin Boards. Phil replied that RIG membership gave people the rights of access to several bulletin boards and asked members to contact him afterwards for details.

A member raised the question of interference from Mercury Paging Transmitters. Phil said that this seemed to be less of a problem, partly because the transmissions were better controlled and partly due to improvements in receiver design.

The meeting closed at 5.15 pm, approximately 50 members were present.

REMOTE IMAGING GROUP - INCOME & EXPENDITURE - 1ST JANUARY - 31ST DECEMBER 1988

EXPENDITURE			INCOME		
A/D	307.32		FEED	1022.83	
PRE-AMP	326.35		MOUNT IN DISH SALES	0.00	
DISH	1638.75		RECEIVER	1153.63	
FEED	1504.93		DOWNCONVERTER	1519.38	
MOUNT	0.00		A/D	503.75	
RECEIVER	953.56		PRE-AMP	242.92	
MISC & SAT MODULES	962.91		MISC & SAT MODULES	988.10	
DOWNCONVERTER	1537.80		DISH & MOUNTS	3499.41	
		7231.62			8930.02
LESS INCR IN STOCK		377.90			
		6853.72			
NEWSLETTER PRINTING	2967.00		SUBSCRIPTIONS	4573.94	
NEWSLETTER POST	1468.62		BACK ISSUES	407.70	
GENERAL POSTAGE	178.03		ADVERTS AND		
SECRETARIAL SERV	231.00		COMMISSION RECEIVED	838.35	
RALLY EXP	370.66		DONATIONS	93.41	
COMMITTEE EXPENSES	200.00		OSCAR LOC	2.05	
BANK CHARGES	29.65				
OFFICE EXPENSES	366.43				
STAND	192.00				
		6003.39			5915.45
TOTAL		12857.11			14845.47
SURPLUS OF INCOME OVER EXPENDITURE		1988.36			
		14845.47			14845.47

BALANCE SHEET AS AT 31st DECEMBER 1988

EMPLOYMENT OF FUNDS		FUNDS EMPLOYED	
STOCK - NEWSLETTERS	533.50	SURPLUS B/F	6340.01
STOCK - EQUIPMENT	3670.49	SURPLUS FOR PERIOD	1988.36
CASH AT BANK	4121.79		
CASH IN HAND	2.59		
NET ASSETS	8328.37	SURPLUS C/FORWARD	8328.37

Recording weather satellite signals in the field

Equipment needed for the reception of signals from NOAA 9 and 10.

Yagi antenna
Receiver
Loudspeaker (if not included in the receiver)
2.4KHz oscillator
12 Volt battery pack (8 x 1.5 volts)
Portable stereo tape recorder
Leads

This technique has been developed for signals that are to be processed using a framestore.

Most weather satellite receivers can be powered from a 12 volt supply and are suitable for portable use.

You will want to monitor the signals; some receivers have integral loudspeaker but others require a separate one. The audio signal is an excellent way for pupils to tell whether the signal is strongest and hence keep the antenna pointing in the right direction.

Some receivers also have signal strength meter which could also be used.

For best results the signal should be recorded on a stereo tape recorder. The signal from the receiver going to the right track. On the left track the reference signal at 2.4 KHz is stored. When recording "indoors" the framestore provides this signal automatically.

For portable use, assuming you are not going to cart your framestore about, you will need a separate 2.4 KHz oscillator. A suitable circuit for such an oscillator is shown on the next page. (Ed's note: Apologies but I have mislaid this little circuit I will reproduce in the next newsletter) A signal is derived from a 2.4576 MHz crystal and then divided by a chain of binary dividers to give precisely 2.4 KHz. This is followed by an RC network designed to round the signal off and an attenuator to reduce the signal to a suitable level for recording.

The circuit can be easily made on a small piece of veroboard.

There are many portable stereo tape recorders now available but be careful, you can pay much more than you need.

The main thing you need to look for is the ease of feeding signals into the tape recorder. Few seem to have 3.5 mm jack sockets though most have DIN sockets.

One of the problems of cheaper tape recorders is that the large signal levels, typical of those obtained from a good satellite signal (about 1 volt peak to peak), will swamp the recorder and give poor results. You will need to attenuate the signal from the receiver in the same way used on the oscillator. I have found a signal level of about 20 to 30 mv is suitable. For a given tape recorder you will probably have to find the best signal voltage by trial and error.

All you need to do now is check you satellite predictions. Chose a location with a clear view to south and north and switch on. On a good pass you can record up to fifteen minutes of signal.

David Grace.

Amiga News from MICROTEXT

Pictures from space

Amiga owners can now receive free weather satellite pictures beamed down from space with the latest Microtext Teletext Adaptor and just and ordinary T.V. aerial. The pictures originate from sources such as Meteosat, a satellite with built in cameras orbiting high above the equator. The Met office super computers receive the satellites signal and process the picture to make the view appear to be from overhead Britain.

The pictures are transmitted on CEEFAX, but cannot be received on a normal teletext TV, only by a computer with a teletext adapter plus the relevant software. New pictures are sent regularly and are presented as an index of names on the Amiga's screen, any of these can then be downloaded by simply pointing and clicking with the mouse. Any of the images can then be selected for display.
The picture is saved as a compact data file, the microtext software can then select these for display.

Images can be overlaid on one another, this allows a grey scale picture to be placed over a blue sea and green land image.The resulting display can be saved as an IFF files for printing out or processing with any Amiga paint package. The pictures are sent as part of the new BBC's Telesoftware service.

Telesoftware already broadens the appeal of teletext on a micro as users are able to down load data and programmes free from a selection that is changed each week,programmes are available for the PC and the BBC micro, most of which can be run on the Amiga with Commodore's new BBC Emulator.

As well as being able to receive Satellite pictures and Telesoftware the Microtext adaptor enables normal teletext to be received. Features include the ability to print pages, save pages to disc, translate pages to speech and to run completely automatically. It also converts a 1081,1084 or 8833 monitor to a colour T.V.

Microtext will be demonstrating the new system which is available now, at the Comodore show in June.

The price of the Microtext Teletext Adaptor is £124.80 + VAT

Contact Terry Cassell on 0705 595694

7, Birdlip Close, Horndean, PORTSMOUTH

Casio FX730P Prediction Program

from David Kemplen G1NSV

Please find the enclosed program for the CASIO FX 730P programmable calculator. I don't claim any credit for the originality, that goes to David Bailey, (RIG No. 14 Sept 88).

As my work takes me away from home I tend to have time in the evenings to read thoroughly those articles in RIG that I should have read when the magazines landed on the doormat. I decided it would be a good exercise to see if I could put all the separate formulas into a small program, this would reduce the chance of errors due to finger trouble.

This program can no doubt be improved upon and modified to suit various other hand held programmable calculators. I should point out that there were a couple of mistakes in the original article.
In the calculation to find dw it should read 5 cos i^2 not 5cos^2 i, this caused consternation and had me searching for Trig. formulae until the penny dropped, also the calculation for NP should have some extra brackets round the divisor ((360*mm)+dw/mm) otherwise you get a very strange answer for period.

As you will notice I have had to relabel some of the terms to stop the calculator getting tongue tied so I have included a key, so that those who want to, can see how the program follows the original article.

The program itself is straight forward and all you have to do is enter the Keplerian data at the prompts. One point that should be watched is that you only need to enter under Epoch of data that value less the year.

For instance:- Epoch of data = 89232.117294 as we know its 1989 just enter 232.117294

Program variables:

Epoch of data	E
Inclination	I
Eccentricity	X
Rev	R
Drag	D
Right ascension RAAN	A
Mean Motion	B
G.H.A.	G

Semi major axis	Z
Daily change	W
Nodal period	M
Precession	L
Theoretical increment	P

Outputs:

Day number	(INT)E
Ascending node deg W.	Q
Increment	C
Time	T

```
1       REM KEPS TO EQX,TIME,DAY NO.
5       INPUT "Epoch of data",E
10      INPUT "Right Ascension",A
15      INPUT "Eccentricity",X
20      INPUT "Inclination",I
25      INPUT "Mean Motion",B
29      REM  EQX calculation
30      G=99.5+(360*FRAC(E))+(.986*INT(E))
35      Q=G-A
40      IF Q<0 THEN Q=Q+360
45      IF Q > 360 THEN Q=Q-360
49      REM  Calculate semi-major axis
50      Z=331.25*(1440/B)^(2/3)
54      REM  Calculate daily change of perigee
55      W=4.97*(6378/Z)^3.5*((5*COSI)^2-1)/(1-X^2)^2)
60      M=1440((360*B)/((360*B)+W)/B)
64      REM  Calculate increment
65      P=.250684*M
70      L=9.95*((6378/Z)^3.5)*COSI
75      C=(L/(1440/M))+P
80      T=FRAC(E)*24
81      K=FRAC(T)*60
82      S=FRAC(K)*60
85      PRINT INT(T);"hrs";INT(K);"mins";INT(S);"secs GMT"
90      PRINT"Day number";INT(E)
95      PRINT"EQX ";DMS$(Q);" deg West"
100     PRINT"Nodal period";M
105     PRINT"Increment";C
```

Changes in the Meteosat Schedule

The following is taken from a Eumetsat circular dated 3/5/89, and gives approximate details of the forthcoming changes. Meteosat 4 will become operational on the 19/6/89 at 9.00 gmt. This will be coincidental with the introduction of the new schedule, and the changes in the transmission frequencies. Some confusion concerning when the frequency changes were due to take place was caused by technical problems at the ground station, but these have been overcome (someone loaned them a crystal!).

For reference Channel A1 will be 1691 MHz and Channel A2 will be 1694.5 MHz. The new schedule is included in the center section. The main WEFAX and DCP will be on A1. The High Resolution Image Transmissions and the GOES relay transmissions from Lannion will be on A2. During the actual change over on the 19/6/89 at 9.00 gmt there will be a break in normal services, but this will be advised upon in the administration messages.

Some of the changes in the new schedule relate to the GOES retransmission which are increased to 3 hourly repetition rates. The Test image (Test 0) will be sent at 2.38 and repeated 3 hourly. Cloud Top Heights formats will be on A2 at 3.06, 9.06, 15.06 and 21.06. The transmission of M-formats, WEFA 1, WEFA 5 and WEFA 6 will be on A2 at 2.02, 19.02 and 21.02. There will be 8 more slots for D3 images on A1. DTOT will be sent 3 hourly at 0.30, 3.30 etc.

During daylight hours CTOT will be sent at 9.38, 12.38, and 15.38, at nighttime ETOT will be sent in this slot. C2D Images will not be on A2 but on A1 and their number reduced. Images C4D - C9D will be sent twice per day. Four D1 images will be omitted.

Goes Images will be increased to 3 hourly intervals and will provide new images from main and synoptic hours as soon as possible after processing is completed. The complete schedule is very tightly printed and is included in the centre section. The hours are along the top of the 3 sections and the +mins on the left hand side. The image is given in the usual format and the source time (time image was scanned to nearest 30 mins) eg D2 24 is the D2 image at noon.

Notes on constructing the LNA on P7

A short note from the specialist Gasfet cruncher

I have now built the first two stages and they work well. The output was taken directly from the output of C8. The noise figure is very low, but I have no means of measuring it at present. On my unit there was some tendency to oscillate, but this was easily stopped by placing a small piece of the conductive foam which the devices are sent in, adjacent to the input circuit. Construction is relatively simple, but the chip capacitors are very small and difficult to place in position. This was overcome by gently soldering a short length of solder onto one end, to hold them by, this also makes them easier to find if they are misdirected. Solder on all passive components first, then the 78L05, and then make certain that you are well earthed, the soldering iron was disconnected from the mains while actually doing the soldering of the active devices. Hold the Gasfets by either of the source leads or drain lead, never touch the gate lead first. Touch the conductive foam before picking up the gasfet by the source lead, it can then be placed into position on the components and soldered. Solder the opposite source lead, then the source lead that you held it by, then the drain lead and finally the gate lead. By connecting it in that order you keep everything at board potential and save on heart attacks. I know some of the leads look long but, so what, it works remarkably well. You must use the special porcelain capacitors as they have very high Q qualities. The coax I used was UT141 the same as I used on the Quad Loop Yagi. Don't forget to plug the soldering iron back in now and again because those chip capacitors are difficult to rivet in. Just make certain that it is unplugged when actually using it. If many of you are interested in the components for this project, perhaps RIG could purchase the components in bulk for you. Castle Microwave were the suppliers of the 72084's, which cost £7.54 each plus P & P plus VAT = just over £20 for 2 Gasfets at present day prices. There is one bonus with this project, no pots to twiddle or trimmers to adjust - nothing. Perhaps this time I shall leave it alone and it will continue to give high gain and very low noise

HN

MEMBERS LETTERS:

Dear Phil,

Ken Willis wrote in Newsletter 16 about his enthusiasm for the SATFOOT program supplied by AMSAT UK and I fully support this. In this, as with so many other programmes, I am always tempted to see if I can make small adaptations to make them more suitable for my needs. So I offer a few suggestions below, with no offence intended to James Miller but with the thought that others may also have made adaptations which I might learn of.

Firstly I found that when my version from AMSTAT-UK was booted I was required to step through a rather lengthy set of instructions before getting to actually run the program proper. Now I can never commit to my own personal memory all these instructions, so I prefer to READ them into a word processor, in my case VIEW, and have a print-out to hand. It is a bit tedious extracting the instructions from the LOADER program and word processing it to get a neat set of instructions, but once done it is there for good and very useful too. If anyone wants this rather than doing it for themselves the usual SAE and or disc (not 40t DFS) will be rewarded!

Having got the instructions in hard copy I now want to by pass the on screen version and this is achieved in LOADER as follows :-

New lines:

```
152 CLS: PRINT"DO YOU WANT INSTRUCTIONS (Y/N) ?"
154 REPEAT: response$=GET$:UNTIL INSTR ("Yy/Nn",response$)
156 CLS
```

Amended line

```
160 IF response$="Y" OR response$="y" PROCintro0 :PROCintro1
```

New line

```
175 IF response$="N" OR response$="n" GOTO 280
```

This form of response to an on screen prompt doesn't require a return after the answer so when we go to SATFOOT and are asked what map we want, then the same form of program line is desirable as follows:-

Amended line 390

```
DEFPROCmap : PRINT"Normal or Antipodes map [N/A] ":REPEAT
:M$=GET$UNTIL INSTR ("NaAa",M$)
```

Sometimes it is nice to get a printer dump of the satellite footprints as seen on the screen and this can be fairly simply achieved in SATFOOT if you have a printer dump ROM or equivalent in your machine as follows:-

Amend line

20 ONERROR *BPRINT

The *BPRINT command is for the DUMPMASTER ROM but can be replaced for other screen dump commands as necessary. Now at any stage of screen display you can press the escape key and the whole program stops while a screen dump is carried out. At the end of this, at present it is necessary to BREAK and reboot the program although this is not too great a hardship as the date settings are retained in memory. But there may be a method of letting the program continue which I haven't yet solved.

Well I hope James doesn't mind me mucking about with what is really an excellent program or may be by this time the latest version from AMSAT already includes these facilities

Peter Ball G1YFL

** Ed's note could any RIG members in Portsmouth/Southsea area help?
Dear Phil,

I an physically handicapped and an owner of a weather satellite receiver system, I got your address from Chris Pretty, the manager of Martelec in Farnborough, Hampshire.

I am typing this letter since I bought this system last September, I have been unable to get the pictures through on my computer's monitor. I can pick up signals, but no pictures. I have written to Chris Pretty and nothing has been done about it. Even my brother in law has also phoned him twice recently but nothing! He just gave your address. So, I was wondering if you have got anyone on your books in the Portsmouth area that would come and see what is wrong with it, please.

I would be very grateful if you could possibly help me out as I am getting so frustrated and fed up. After all 9 months is a long time to wait and a lot of money as well. Being disabled is not an easy life really.
I hope you will find someone very soon and let me know.
Your's Faithfully
Paul Abbatt. Tel 0705 750440

Dear Phil,

Well I have finally succumbed to the Henry loop aerial bug. After holding out for several months while the debate has raged. I could resist no longer, especially with the added incentive of tuning into some GOES transmissions.

I made the aerial as per Henry's design, but the only scrap copper I could get was 4mm! I can tell you the fingers were pretty sore after trying to bend that sort of thickness. I did re-jig the lengths slightly to compensate for the different diameter, but apart from that no other changes were made. I tested the aerial out in a conservatory area, pointing through glass, and immediately got a good signal, although weak. Finding the optimum angles bought the strength up again, and then realising that I hadn't fitted the back reflector!! the strength improved marginally again.

Through the glass with a Gas-fet pre-amp I could get virtually noise free signals on Meteosat 3, with occasional clicks of noise when one of the 3db dips occurred. On Meteosat 4 test transmissions these disappeared altogether. Putting the aerial outside did away with the need for the pre-amp as far as signal strength was concerned, although compared to my home brew 5 foot dish the low level "furry" noise was slightly increased. I have enclosed a print (see centre-fold) which was done off a tape recording made in haste this week. I say that because the haste meant a couple of missing rings on the aerial due to a low flying doorway, and nothing optimised. At least I hope the print of Meteosat 3 Test O with its electronically produced 64 grey level scale will not only vindicate the aerial, but will also test out your newsletter printer! The one disappointment was to find that NASA had drifted GOES about 10/15 degrees west, I was grateful to Lawrence Harris for confirming that he had tracked the satellite as it had been moving westwards, until reception was virtually nil, as is the situation now. There is just a glimmer of hope that if the loan of one of the Meteosat 2 or Meteosat 3 spacecraft to the USA goes ahead, we might just get usable transmissions again. In the Autumn as Bob Sansoni pointed out in that helpful chart, it may be drifted a little to the east again to keep a check on the winter storms, so it is NO-GOES situation until then!

I haven't included an "Amiga corner" this month as there's nothing much to report this time, except that request for disks keep rolling in, and I've played around a bit more with the ICS interface unit reviewed in the last edition. The unit transmits as well as receives using a standard fsk format, so the idea occurred to me that I could perhaps send computer derived pictures back into the demodulator part of the unit and then with some adjustments to gain and black level, export it out to my main framestore and photographic printer,

Well, considering the process involved, the results seem astonishingly good. I've enclosed a print which I hope you might also be able to reproduce (again see centrefold) to show how well the initial trials have proceeded. The amazing thing also is that the internal clock of the Amiga seems to be so accurate that I have printed the picture with out any external sync!

I've also been plagued with the interference from the pagers, but only on one of my receivers. The offending one is as per the German design in VHF Communications. The problem is now solved though! One of Cirkit's broadcast tuner sets (EF5804) with a new set of coils (red) at the front end has eliminated the problem entirely, so for me its not been filters, but a poor front end / mixer design.

Can I just take this opportunity of thanking all the committee for yet another excellent edition, and for all the hard and unpaid work that goes into it.

James Brown.

RIG HELPLINES:

General Enquiries & PCB Supplies	Phil Seaford	0525 384419 7.30pm - 9.0pm
NOAA information	Henry Neale	094 585 353
Russian, Chinese satellite info/status	Les Currington	0707 326058
Schools/ Educational enquiries, Meteosat status and European Space Agency	Colin Hall	School 021 778 1311 Home 021 449 0006
Framestore technical support	Mike Coombs	0530 243494 7.30pm - 9.30pm
"	Ian Gurton	05827 3770 7.30pm - 9.30pm
"	Dermot Dobson	Correspondence preferred
RIG Dish & Feed Horn Stockists	See back of newsletters	
Supplier problems co-ordinator	Stan Ames	05827 60538
RIG at Rallies 1989	Mike Coombs	see above for No.

AMSAT-UK, Hon Sec. Ron Broadbent, G3AAJ,
94 Herongate Road, Wanstead Park, London E12 5EQ

As Secretary I am asked for information regarding all types of micro of which I have little knowledge, so to provide better information to RIG members on specific computer equipment we have identified the following helpers for specific machines & interfaces:

BBC Micro	Stan Ames	see above
Commodore Amiga	James Brown	0656 712632
Atari ST, Archimedes	Peter Newman	0487 812121
IBM PC	Dermot Dobson	see above

Please call at sensible hours ie 7.30pm - 9.30pm

Any of you who don't have the time to spare can skip this page

Phil had sent all of the RIG 17 Newsletter to me on Friday 2nd June. The only difference this time was that it was all on 5.25" disk. No problem, I have a RIG member who lives in Spalding that has a Laser printer. As usual most of the copy was set out as it should be plus of course the Adverts and the other centre bits. The pictures had gone off to its printer a week ago, and they confirmed that there would be no problems. I even told them that the main newsletter was delayed (as usual) so there was no rush at present. Phil had sent the disk to me just before he went on holiday. Even Henry was going away for two days (this years holiday), so when I arrived back there the disk was, just as arranged. So what's the problem? On the face of it nothing. As usual I read through the newsletter correcting the odd mistake here and just tidying up the format in places, I mustn't do too much or the sec. will be after me. Still everything OK. One small problem - no predictions and the only copy of the accounts I owned had provisional typed on them. Contact the treasurer, he does all that sort of thing. No reply, no accursed answerphone, no nothing, no reply from his works number it was the weekend. After leaving the phone number at his works ringing for four minutes (I knew he was very busy) I had almost given up all hope when someone answered. They had stood there not wanting to get involved with anything at the weekend, but were intrigued as to who would ring the phone for such a long time. It wasn't Bob but he was there. Success Bob had problems but he would see to all of my troubles for Monday. That part all resolved itself. Next problem, in the index the centre pages were pages 28 and 29. But there were only 48 pages altogether, so the middle would be pages 24 and 25, but then I found that all the Dartcom pages, the corner shop and Dish stockists were not included in the main files on the disk. However hidden in an extra section were these extra pages, so what's the panic ? To make 56 pages I needed another 8 pages of copy and there were only 7! What am I going to do with page 49? I could leave it blank, but there are already too many half filled pages and they all cost money. It's no good panicking, it would still be empty if I did. I thought of all the members ads this page could have carried, but I didn't have any, or the commercial advertisers that could have filled this space and brought us good revenue in, if I had any. Then I thought of all the budding authors who would only be to pleased to have displayed their skills albeit to a limited but growing readership just here. I could have filled it with the LATE NEWS but that had already been allocated to page 43. Anyway there was no LATE NEWS and page 43 had been used for something else, so what could I do with page forty nine? What's that? There are only 2 lines left on page 49! You've got to keep your eyes on it all of the time or else someone will WOG it.

RIG 136-138 MHz SYNTHESISED SATELLITE Rx

INTRODUCTION

This receiver which is only available through RIG has been specifically designed to receive F.M. APT. (automatic picture transmissions) from NOAA. and other orbiting weather satellites in the 136 to 138 MHz band. It will also function as an IF. receiver when used in conjunction with a down converter for reception of Geostationary weather satellites in the 1.69 GHz band.

The receiver is a double superhet design with a 1st 1.F. of 10.7 MHz using 2 cascaded ceramic filters to provide an IF. bandwidth of 50 KHz, and a second IF. of 455KHz. A third ceramic filter has recently been added to address recent interference problems attributed to the recent pager frequencies allocated just above the weather satellite band.

The RF amplifier and lst mixer use low noise BF981 dual gate MOS FET's with an SL6601 2nd mixer, IF., and demodulator. This is followed by active high and low pass filters to provide an optimum AF bandwidth for reception of APT. signals.
The synthesiser can provide 10KHz steps with specific individual channels stored in an EPROM.

A 1 watt AF output stage provides audio to drive an 8 ohm loudspeaker with two additional low level AF outputs for driving a cassette recorder.

A further AF output is provided to drive the YU3UMV framestore. This level is set using an on board preset.

FEATURES:

1. 1600 channel capability divided into 16 pages internally preset using a DIL switch with 100 channels per page. Maximum scan per page can be preset from 10 to 100 channels in steps of 10 i.e. 10,20,30, etc. Scan halts when signal received above squelch threshold. Channel is held for approx. 5 seconds after loss of signal after which scan continues.

2. Fully adjustable squelch.

3. Two low level AF outputs, one squelched the other unsquelched, (approx. 80mv R.M.S. at 17KHz deviation), for driving a cassette recorder. A further output of 1v RMS is provided to drive the YU3UMV framestore.

4. Remote control of cassette recorder by a volts free c/o contact of a relay which is controlled by the receiver squelch.

5. 'S' meter output with sensitivity adjustment. (100 to 250uA meter required).

6. DC. feed to aerial feeder available by on board linking to provide up feeder power for mast head pre-amp / down converter.

7. Unit supplied fully programmed for all known satellite APT. and Beacon channels.

8. Channel indication using 7 segment LED displays ie 00 to 99.

9. Up/down scan switch can be connected to provide quick selection of a wanted channel.

10. Scan halt and channel override facilities.

11. Optional direct frequency read-out using LCD display module.

This unit may be ordered as an assembled and tested complete with its own specific measured noise figures as a module less squelch pot, volume control, loudspeaker, up/down scan switch 'S' meter and scan halt switch from the secretary.

SPECIFICATION:

POWER REQUIREMENTS:- 11.5 to 13.5 volts DC. at 500mA max.

SENSITIVITY:- 0.2uV pd for 12 dB SINAD at 10 KHz deviation.
0.3uV pd for 20 db quieting.
S/N ratio at 1uV pd for 17 KHz deviation > 40dB
S/N ratio at 5uV pd for 17 KHz deviation > 46dB

RF BANDWIDTH:- 3 MHz @ -3 dB points.

IF. BANDWIDTH:- 50KHz

IMAGE REJECTION:- > 70 dB

AF FILTERS:- High pass filter cut off freq. = 700 Hz
Low pass filter cut off freq. = 4000 Hz
AF bandwidth 400 Hz to 4000 Hz (- 6dB points)
ie specially tailored for the reception of
Weather satellite data.

AF Outputs:- a) 1 watt RMS. into 8 ohm load for less than 10% distortion. 200 mw R.M.S. into 8 ohm load for less than 5% distortion.

b) 80 mV R.M.S. into 50 KOhm load from both squelched and unsquelched outputs for 17 KHz dev. @ less than 3% distortion.

c) 1 Volt R.M.S. into lK ohm load for less than 5% distortion.

MEMORY ORGANISATION:- The unit is supplied preprogrammed as follows:-

Page 0:- All known APT. frequencies including U.S. and U.S.S.R. weather satellites. (10 channels)

Page 1:- Geostationary and orbital beacon frequencies, which contain the phase modulated split phase data from the low bit rate instruments and space craft telemetry. (5 channels)

Page 2:- A selection of frequencies in the 136 to 138 MHz band know to be used or have been used by APT. and non APT. satellites. (58 channels)

Page 3:- All 10 KHz steps between 136.000 to 136.990 MHz. (100 channels)

Page 4:- All 10 KHz steps between 137.000 to 137.990 MHz. (100 channels)

PCB DIMENSIONS:- 210 mm x 95 mm.

see RIG SHOP Corner for price information

DARTCOM 1.69 GHz METEOSAT DOWNCONVERTOR.

This down converter has been designed to convert the signals from METEOSAT CH1 and CH2 automatic picture transmissions on 1.6945 GHz and 1.691 Ghz to 137.5 MHz for reception on a standard F.M. VHF. weather satellite receiver.

The down converter uses MFG 1202 GaAs FET's as the R.F. amplifier and mixer providing sufficient gain and low noise figure to obtain noise free pictures using the R.I.G. 1 metre dish (or similar), and suitable feed with out the need for a pre-amp.

The unit can be supplied either as a completely assembled and tested down converter in a weather proof box, or as an assembled and tested module mounted in a tin plate box.

The converter has been designed to be mounted in close proximity to the dish with all power and channel change-over facilities being supplied by the single coax cable connecting the down converter to the VHF. receiver.

If no DC. supply feed via the coax feeder is available then the complete boxed converter can be supplied with a waterproof power and channel change-over connector.

The converter can also be supplied to receive the Advanced Very High Resolution Radiometer data from NOAA orbiting satellites on 1.698 GHz and 1.707GHz to special order at a small additional cost - details on request.

When used in conjunction with the RIG synthesised VHF. satellite receiver this converter will give typically a signal to noise ratio of 32dB for 10 KHz deviation for a signal input to the converter of -112 dbm or 0.562 uV PD.

FEATURES.

1). Thermally controlled crystals to ensure channel stability over a wide range of ambient temperatures.
2) DC. powered from either direct feed to converter or via VHF. output provided that the host VHF. receiver has remote DC. feed to aerial cable facilities.
3) Unique channel change facilities.
4) 50 ohm N type socket for input and output on module.

SPECIFICATION.

DC. SUPPLY :- 12.0v to 14.5 v at a peak in rush current of 700 mA falling to 250 mA after approx. 10 seconds (crystal warm up).

INPUT R.F. CHANNELS:- 1.6945 GHz (METEOSAT CH 1)
1.6910 GHz (METEOSAT CH 2)
or to special order:-
1.6980GHz(NOAA, AVHRR)
1.7070 GHz(NOAA. AVHRR. data)

R.F. OUTPUT :-137.5MHz
OVERALL GAIN:- Typically 24 dB
NOISE FIGURE:- Typically 2 dB

R.F. TERMINATIONS:-50 ohm N type input and output on boxed converter.
50 ohm N type input and 50 ohm BNC. outputs on module.

DIMENSIONS (L x W x H) :- a). Module 181mm x 73mm x 46mm.
b). complete converter including box :-
240mm x 120mm x 100mm.

Please that these dimensions do not include connector projections.

PRICES:- see 'RIG Shop Corner overleaf'

YU3UMV FRAME STORE A to D ADAPTER.

INTRODUCTION.

Much has been written on the importance of setting the span of the A to D converter in order to utilise the full capability of the YU3UMV frame store.

These levels change not only between the various formats transmitted, (ie Infrared and visible light), but also vary between different satellites and from pass to pass, due to changing light levels.

A-D ADAPTOR DETAILS.

This unit consists of a ready built and tested module designed to overcome these problems. The module has been made in the form of a plug in "piggy back" board which fits in place of the ADC 0804 with the minimum of disruption to the original unit.

The module will indicate the "peak black" and "peak white" levels of whatever image is being written into the memory, whilst at the same time allowing accurate setting of both these levels to obtain the best possible pictures.

The ready assembled PCB. is supplied with "peak" black and white adjustment pots, molex connector, indicator, cable and 20 pin I.C. holder for those of you that soldered the ADC 0804 into the PCB.

Price:- see overleaf

RIG SHOP

Meteosat Downconvertor:-

a). Assembled and tested module in tin plate box:-
£129.69 + £1.50 p&p.

b). Complete mounted in weather proof box:-
£157.96 + £3.00 p&p.
Waterproof power and channel change connector £10.00 extra if required, but note these functions can all be done via the coaxial downlead.

RIG VHF Scanning Receiver

a) Basic receiver module, with LED Channel number display, fully assembled and tested
£112.55 + £1.50 p&p

b) Same module as above but with liquid crystal frequency display module replacing the LED Channel display.

£151.57 + £1.50 p&p

Cheques for above units payable to "DARTCOM" please

The RIG VHF preamp also available includes a bandpass filter and is ideal for mast-head mounting. The spec. was printed in RIG 7. It is available from the secretary as a built and aligned PCB measuring 85mm by 33mm (3 5/16 x 1 15/16 inches).

Module including first class post £13.37

Other items available by post:

A-D module for complete control of grey levels on the framestore
£18.86

Cheques payable to "Remote Imaging Group" please

Anybody requiring PCBs should contact the secretary, G8XTW.

WHERE TO OBTAIN A RIG DISH and FEED HORN:

The RIG has had specially made, some 1 metre spun aluminium dishes and some compatible horn feed assemblies. These are intended to form the basis of an aerial system to receive signals form Meteosat II.

The cost of the dishes and feed horns has been kept to an absolute minimum. So they will not be available by any form of carriage as packing such an item would be impractical. So UK members only, sorry. They are only available to members who may only collect them from the dispatch points below or from rallies we attend in the future.

When using the dispatch points please use the telephone numbers given to reserve your dish and when collecting please pay by cheque payable to the "Remote Imaging Group".

1 Metre Spun aluminium dish for Meteosat - New thicker ver £38.00
Tubular feed horn with tripod mount for dish above £33.73

Bedfordshire

The Editor/secretary, see front cover

Oxfordshire

Dermot, G8SIN, Tel. 0865 61797
22 Ramsey Road, Headington, Oxford.

Lincolnshire

Henry, G3REH, Chairman, see front cover

Devon

Dave, G4XOU, Tel 0822 613343
15 Milton Crescent, Down Park, Tavistock, Devon.

Sussex

Des, Membership Sec. Tel. 0273 813103

Manchester

Mike (J.M.) Horrocks G8GTP, Tel 061 766 6269
"Fairview", 17 Wood Grove, Whitefield, Manchester.

Hertfordshire

Les, G8LOK, see front cover

Birmingham

Colin Hall - see front cover.

TIMESTEP WEATHER SYSTEMS

WHO WE ARE AND WHERE WE ARE GOING

The History.

August 1984, the BBC micro ruled supreme, a single disc drive cost £199 and Michael Furminger wrote an article in Acorn User titled Downloading the Weather. The pictures illustrated were a diaster, mainly due to poor hardware design and the use of a colour monitor. A new age had dawned bringing weather pictures to the micro user !. Timestep eager to make a fast buck looked at the software and interface, fast buck or not it didn't meet our high standards. Both the software and hardware was extensively redesigned. In less than 6 months a complete system was launched on an unsuspecting public. February 1985 saw a full page Timestep advert in Acorn User, the response was so overwhelming that all further advertising was cancelled and all hands put to shipping units out of the door. As our reputation grew so did the orders, until demand completely outstripped supply. The problem worsened as school and college orders poured in, something had to be done, and fast. The solution was to enlist the help of a major educational distributor. They had the buying power and ability to hold stocks large enough to buffer demand.
Development thrived, first the Colour Framestore then the Meteosat Convertor. Now others were beginning to latch on to this new market. Not to be outdone Timestep entered the USA with their Apple IIe system followed by the Apple II GS Animation program. The Nimbus system captured the imagination of the educationalist, soon afterwards the Archimedes system was launched. Now LANDSAT systems have just been released.

During all this time Timestep have had a policy of only selling equipment that was designed by them, every single part from antenna systems down through software is wholly owed by Dave Cawley Managing Director of the Timestep group of companies.

The Present.

After regrettably abandoning the enthusiast market TIMESTEP ARE BACK ! A range of equipment is now available at sensible prices through distributors, that both keep equipment in stock and offer demonstration facilities (and even a cup of coffee). Timestep have always allowed users a continuous upgrade path, the new Atari Animation system is no exception. Existing users simply plug their Meteosat Receivers in the Atari interface and switch on. Users of other manufactures equipment are given easy instructions. If you are serious about weather then animation is a must, take a close look at our Atari system before making the jump.

The Future.

The Remote Imaging Group have a sensible policy of not allowing advertisers to advertise items not actually developed and available from stock. The computer industry calls these products Vapourware !. Others call it Hot Air ! Well what can we say ? What we will say is, if you are thinking of buying a system or a computer then call one of our distributors first. They can tell you of the exiting products in development, the new and improved image processing facilities.

AMIGA AMIGA AMIGA Stop press. Now in stock. Runs on European and NTSC USA A500. Gives stunning 600x400 pixels and 16 grey levels with a standard monitor. Full image processing using PIXmate. This is the program everybody has been waiting for !

TIMESTEP WEATHER SYSTEMS
WICKHAMBROOK NEWMARKET
CB8 8QA ENGLAND

GAREX ELECTRONICS

***** TIMESTEP WEATHER SATELLITE SYSTEMS *****

SPECTACULAR NEW ATARI *ANIMATED* SYSTEM

Garex are proud to announce that they are the first appointed dealer for this incredible new Timestep product. Following on from Timestep's phenomenal success in the education market, a special low cost Atari ST version of their *animation* system is now available from stock. Simply plug in your existing receiver to view amazing pictures. For the ultimate add a Meteosat receiver for unbelievably smooth 14 frame *animation* that is completely automatic once set up. Just watch the clouds roll by ! New pictures are added twice an hour if required, the oldest being discarded automatically. This sophisticated package will run on any Atari ST1040 and compatible colour monitor. Complete with all software and colour-keyed Atari interface. This equipment is of such high quality that Atari UK exhibited it on their stand at Which Computer 1989 !
Interface and software, just connect your existing receiver. £299.00
Optional colour to 16 grey scale adaptor. £24.95
For those who would like a one-stop-shop, the complete package ready-to-run :
Meteosat Dish, Pre-Amp and Receiver, 43M cable, Atari Interface, Grey Scale Adaptor, 14" Colour Monitor, Atari ST1040, Software (including demonstration disc) and, of course all other cables and connectors. On your doorstep £1,695.00

COMPACT FRAMESTORE SYSTEM

The *BASIC* MICROWAVE METEOSAT system. For no complications a complete plug in and go package that requires no computer, no software, no extra monitor and can be up and running, including dish alignment within 10 minutes of receipt. 256 x 256 pixels and Timestep's digital 64 grey level output gives outstanding results. This is the system that the London Science Museum has chosen to display in the new Space and Exploration Gallery, for the next 12 years !. Stop press. Did you notice this equipment giving totally noise free pictures live at Sandown Park ?.
Nothing more to buy:
Meteosat Dish, Pre-Amp and Receiver, 43M cable, Framestore, 12" B/W Monitor and, of course all other cables and connectors. £995.95
Also available less monitor. £885.00

AMIGA AMIGA AMIGA STOP PRESS !!! Available from stock now. Amazing 600x400 pixels in 16 shades of grey on a standard monitor. Runs on any A500 1Mb. Interface with built in 1.0A power supply and software only £299.00. Use your existing receiver !.

SATELLITE ACCESSORIES

Meteosat receiver. Dish input and 2 watt audio output. £270.25
Meteosat Pre-amp. 15dB gain 0.6dB noise figure GaAs FET. £92.00
Meteosat dish, 0.9M with feed horn. £199.00
10M H100 fitted N connectors. £29.85
NOAA *BASIC* Turnstile antenna, ready wired phasing harness and a connector fitted, complete with mast bracket. £39.95
NOAA *BASIC* Pre-amp, 3 pole filtering, boxed and fitted with connectors, 14dB gain 1.0dB noise figure, for the Turnstile antenna. £24.95
NOAA cable, 50M high quality cable fitted with connectors. £24.95

ALL PRICES INCLUDE UK P&P AND 15% VAT.
***** ACCESS & VISA WELCOME *****

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HARROW HOUSE AKEMAN STREET TRING HP23 6AA
Tel. Tring (044282) 8580
and Cheddington (0296) 668684 Callers by appointment.